

Anesthesia related radiology

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Anesthesia related radiology

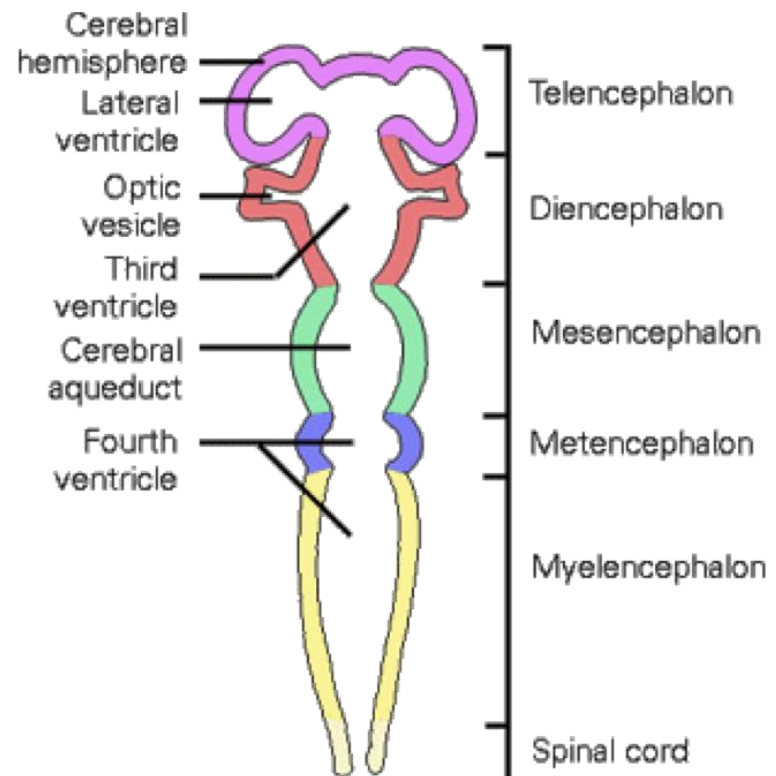
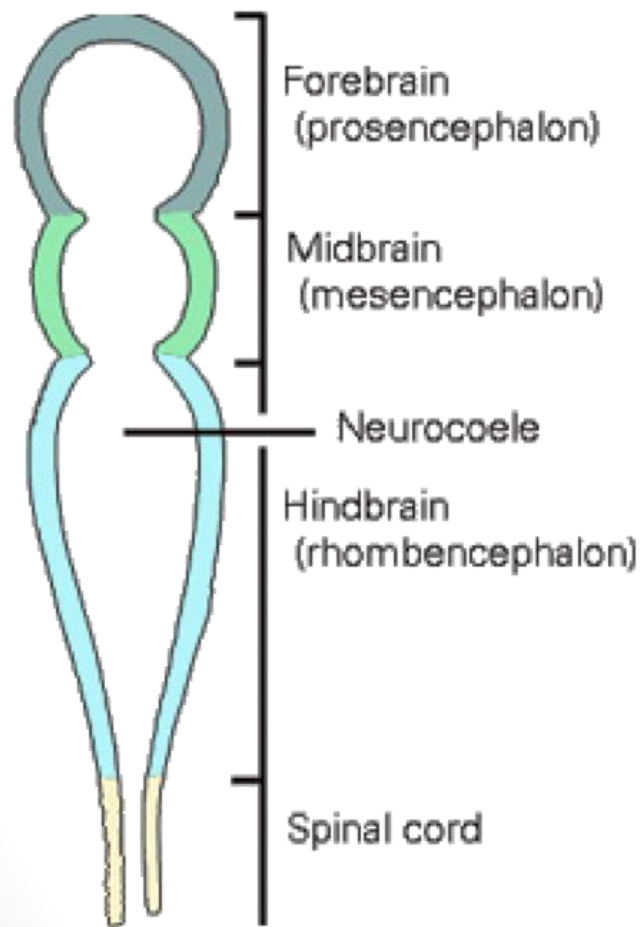
- Chest x ray
- Ct brain

CT brain

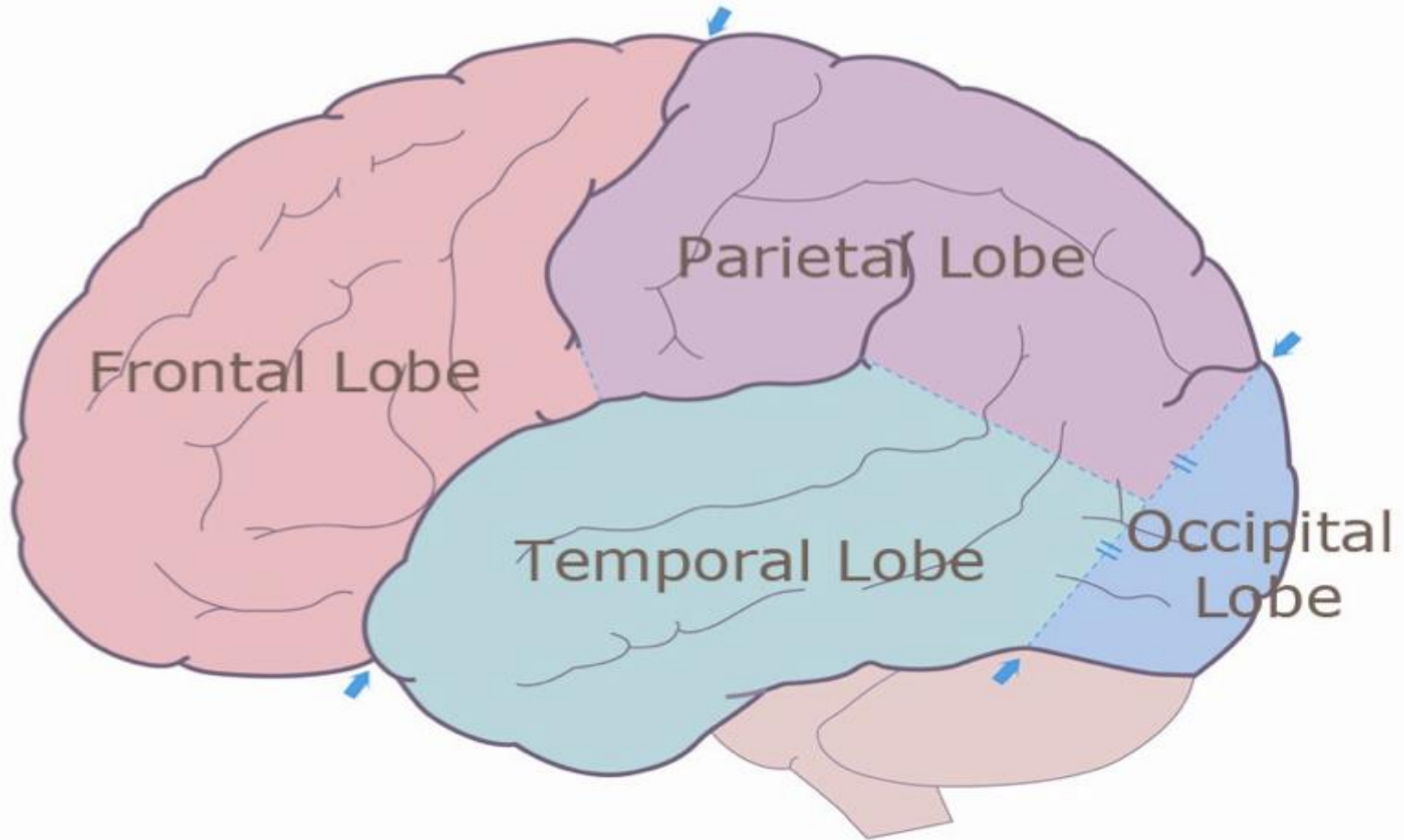
- Anatomy of the brain
- Ct brain

Anatomy of the brain

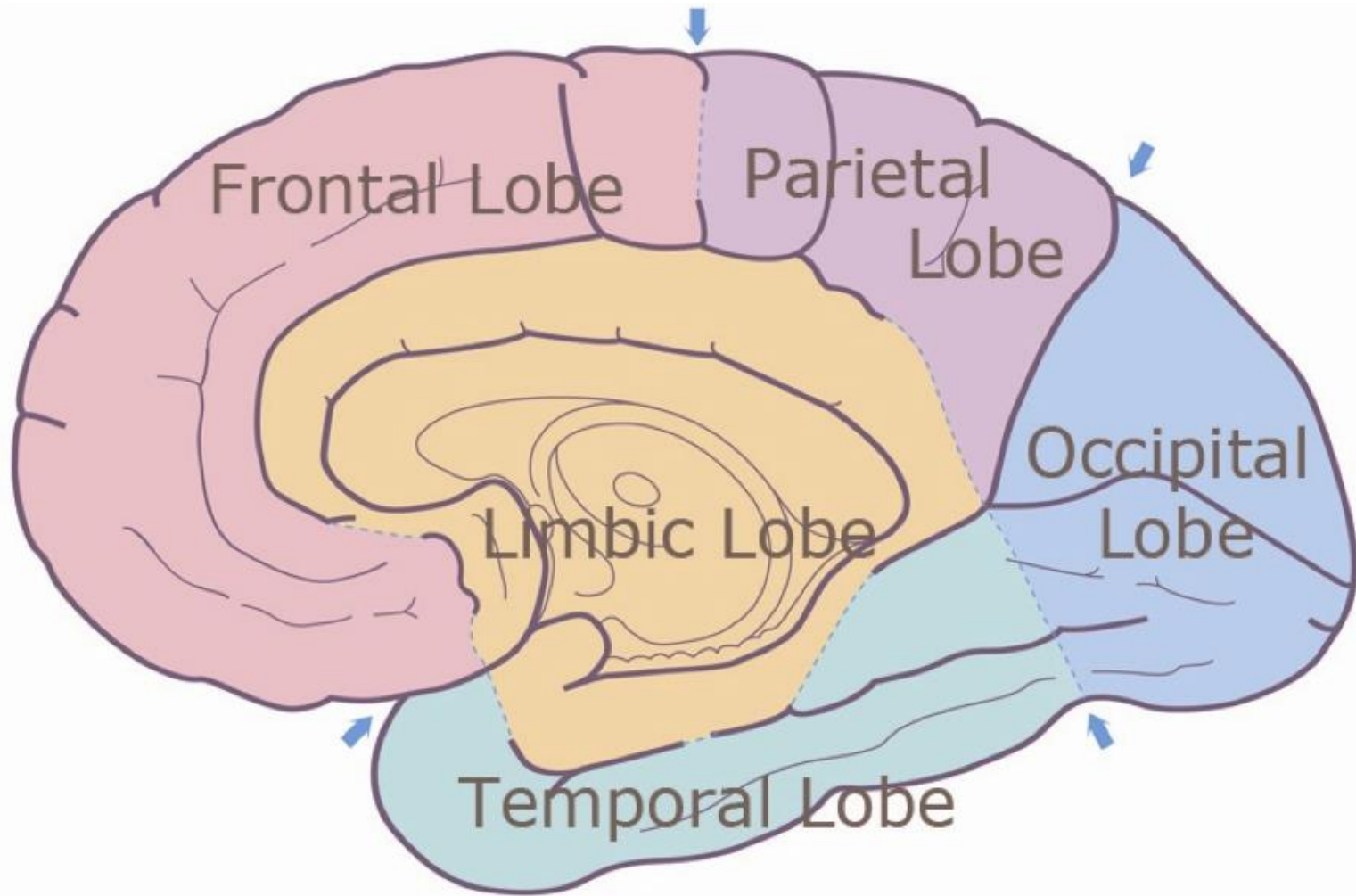
- cerebrum:
 - Telencephalon:
 - Cerebral cortex
 - White matter
 - Basal ganglia (caudate, lentiform , amygdaloid nuclei, claustrum)
 - Diencephalon:
 - Thalamus
 - Hypothalamus
 - Epithalamus
 - subthalamus
- Mesencephalon:
 - midbrain
- Metencephalon:
 - Cerebellum
 - pons
- Myelencephalon:
 - Medulla oblongata



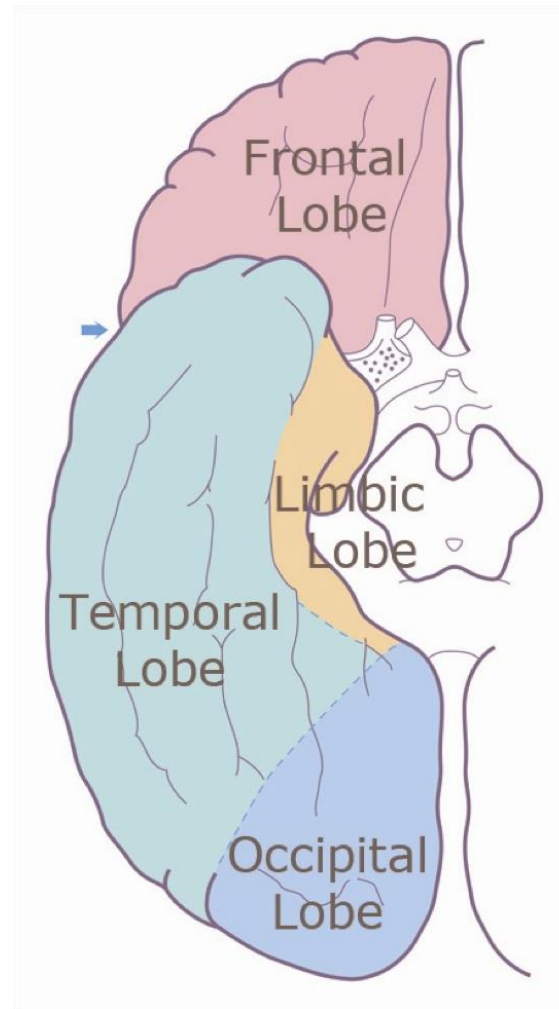
Lobes of cerebral cortex (lateral surface)



Lobes of cerebral cortex (medial surface)



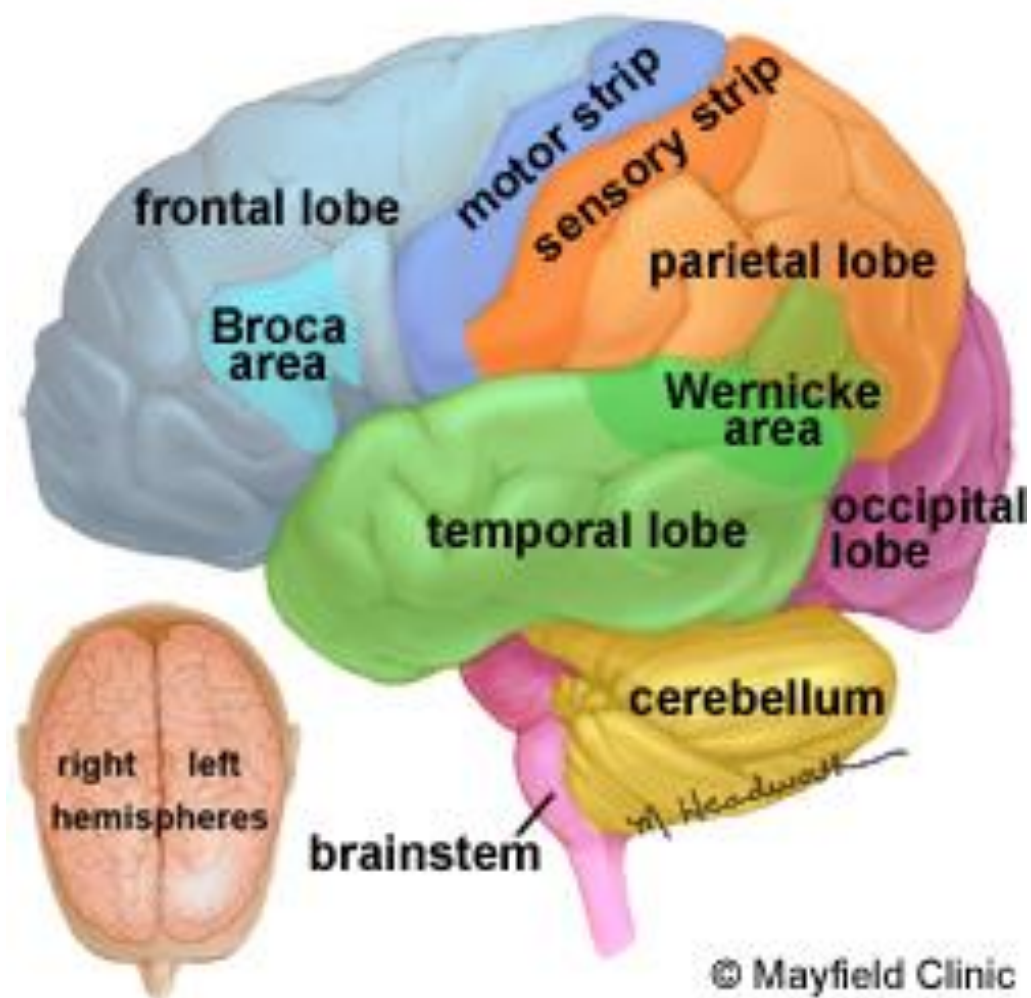
Lobes of cerebral cortex (basal surface)



Function of cerebral cortex:

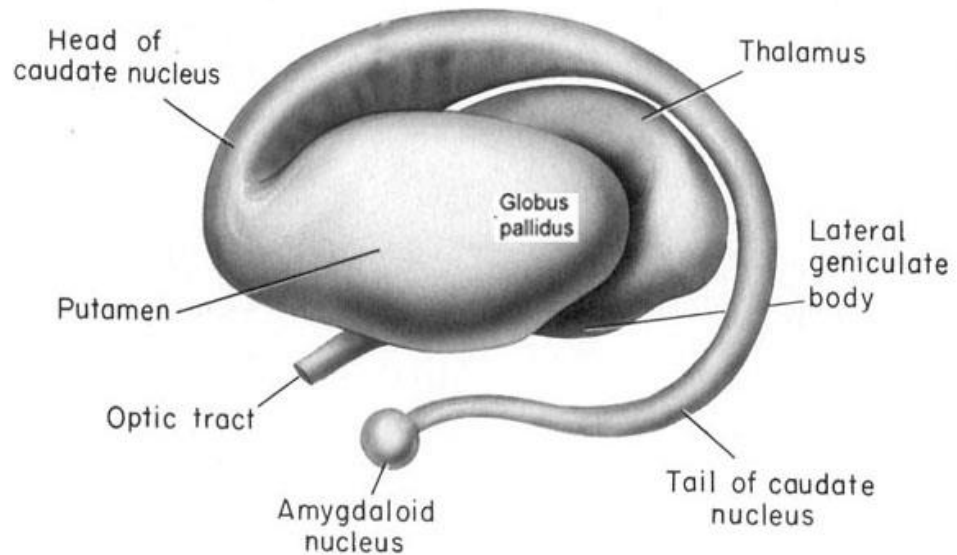
- Frontal lobe:
 - Personality , behavior and emotions.
 - Muscle movement.
 - Speaking and writing (broca's area).
 - Making plans and judgments.
- Parietal lobe:
 - Sensation (touch, pressure, pain, temperature).
 - Position/ spatial orientation.
 - Understanding language (Wernicke's area)

- Occipital lobe:
 - Vision
 - Visual processes
 - Reading
- Temporal lobe:
 - Memory
 - Auditory function(hearing).



Basal ganglia (internal structure of cerebral hemisphere)

Caudate nucleus
Lentiform nucleus
 Putamen
 Globus pallidus
Claustrum
Amygdaloid

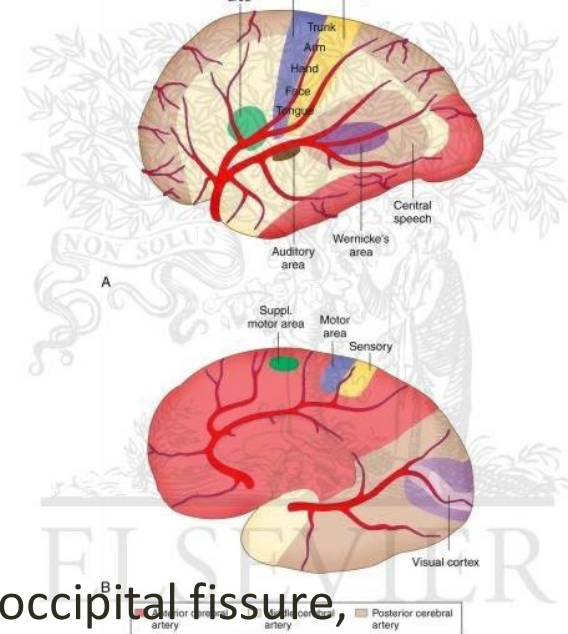


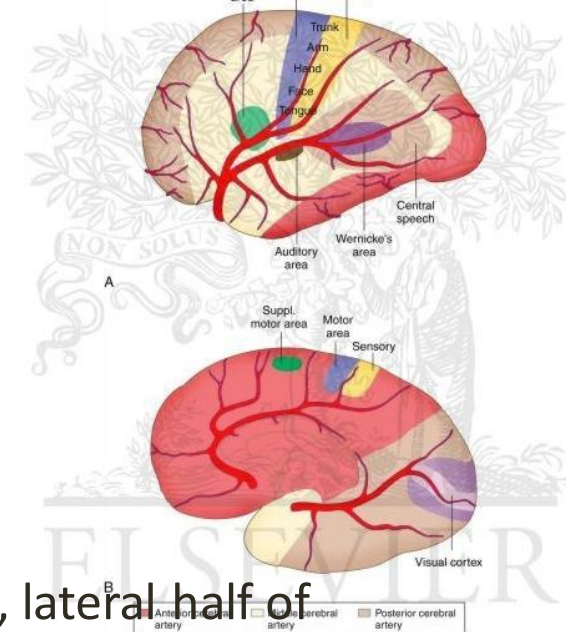
Blood supply

- Internal carotid artery:
 - Anterior cerebral artery
 - Middle cerebral artery
- Vertebral artery (from subclavian artery) form basilar artery:
 - Posterior inferior cerebellar artery
 - Anterior spinal artery
 - Posterior spinal artery
- Basilar artery:
 - Anterior inferior cerebellar artery
 - Pontine artery
 - Superior cerebellar artery
 - Posterior cerebral artery (terminal branch)

Internal carotid artery

- Anterior cerebral artery:
 - Branches:
 - Cortical: medial surface of frontal pole to parieto-occipital fissure, medial half of orbital surface, strip of one inch of lateral surface.
 - Septal region
 - Corpus callosum
 - importance:
 - Motor and sensory area of L.L.
 - Septal region: small lesion cause prolonged unconsciousness
 - Corpus callosum : apraxia (inability to make purposeful movement).





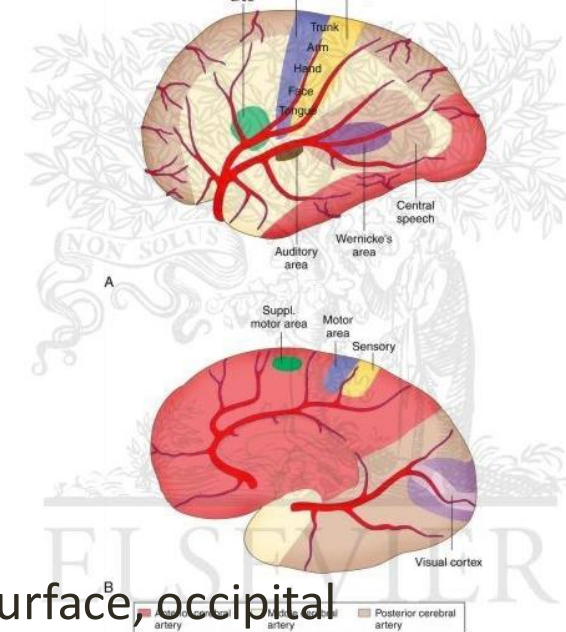
- Middle cerebral artery:

- Branches:

- Cortical: insula, lateral surface , temporal lobe, lateral half of orbital surface.
 - Central branches: artery of cerebral hemorrhage.

- Importance

- Motor and sensory area for whole body except L.L.
 - Auditory area (temporal lobe).



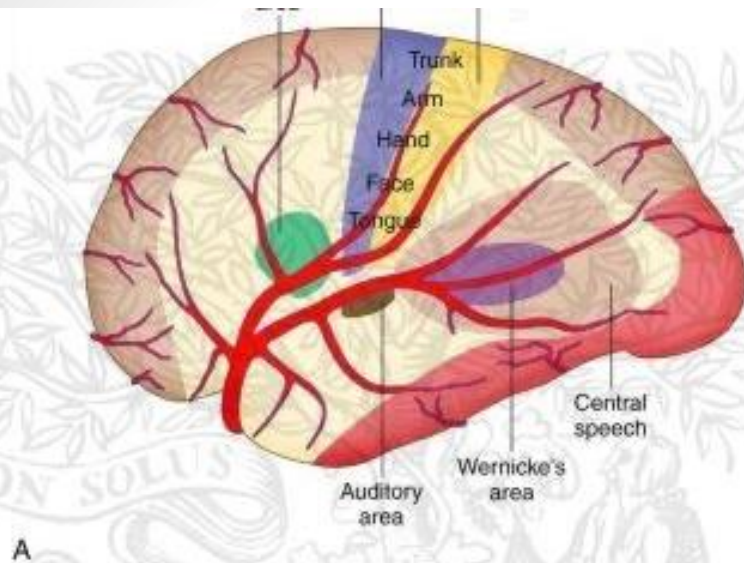
• Posterior cerebral artery:

• Branches:

- Cortical: inferior surface, post part of medial surface, occipital lobe, lower part of temporal lobe on lateral surface.
- Central: cerebral peduncle and thalamus.
- Posterior choroid artery: choroid plexus of third and lateral ventricle.

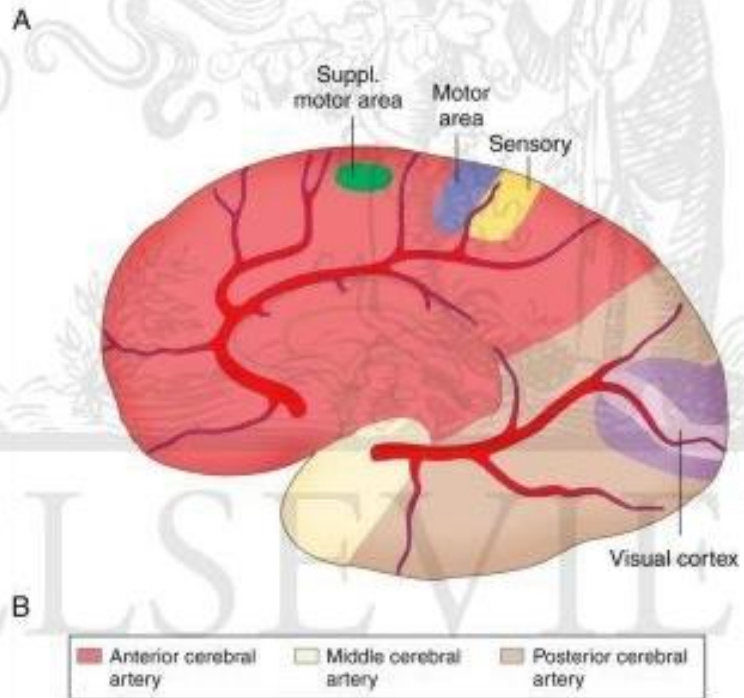
• Importance:

- Vision (occipital).
- Thalamus, midbrain.



Lateral surface:

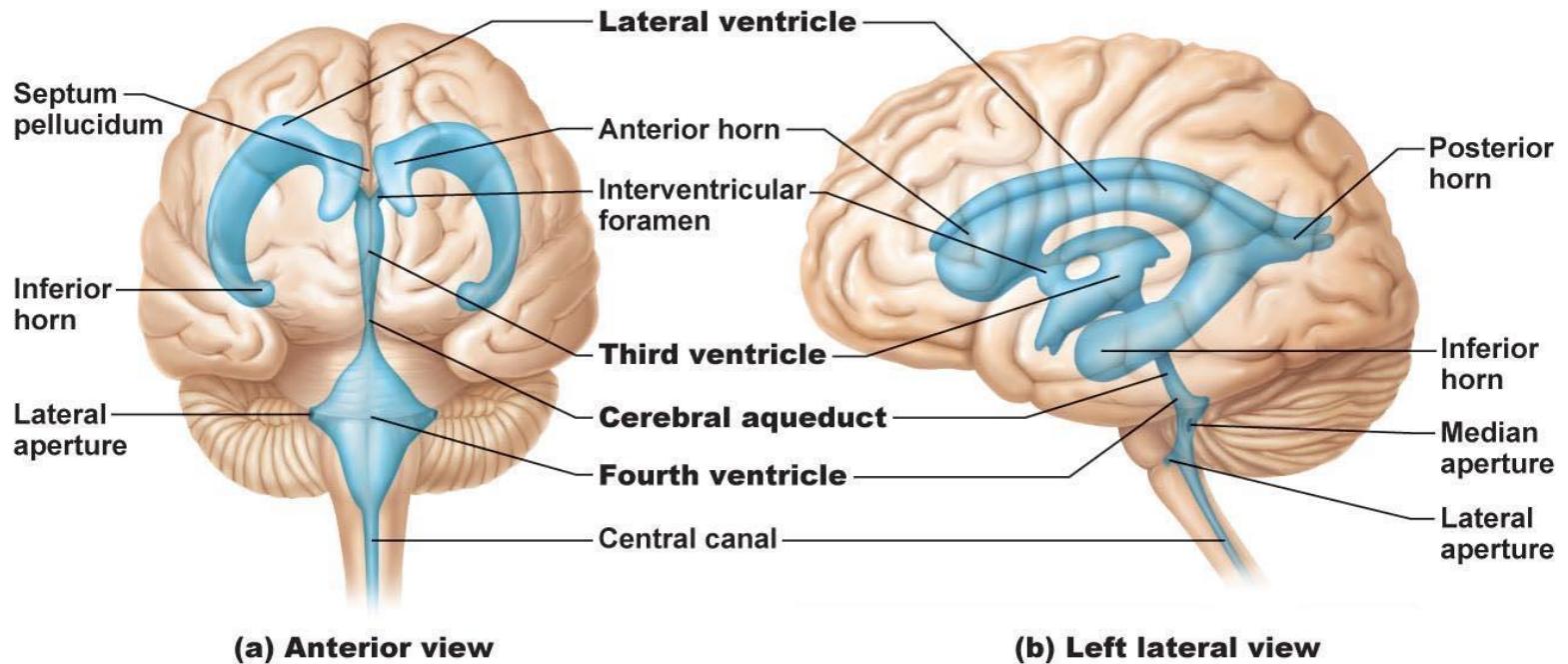
- Anterior cerebral: one inch from frontal lobe to parieto-occipital sulcus.
- Post cerebral: occipital lobe, lower temporal
- Middle cerebral: rest.



Medial surface:

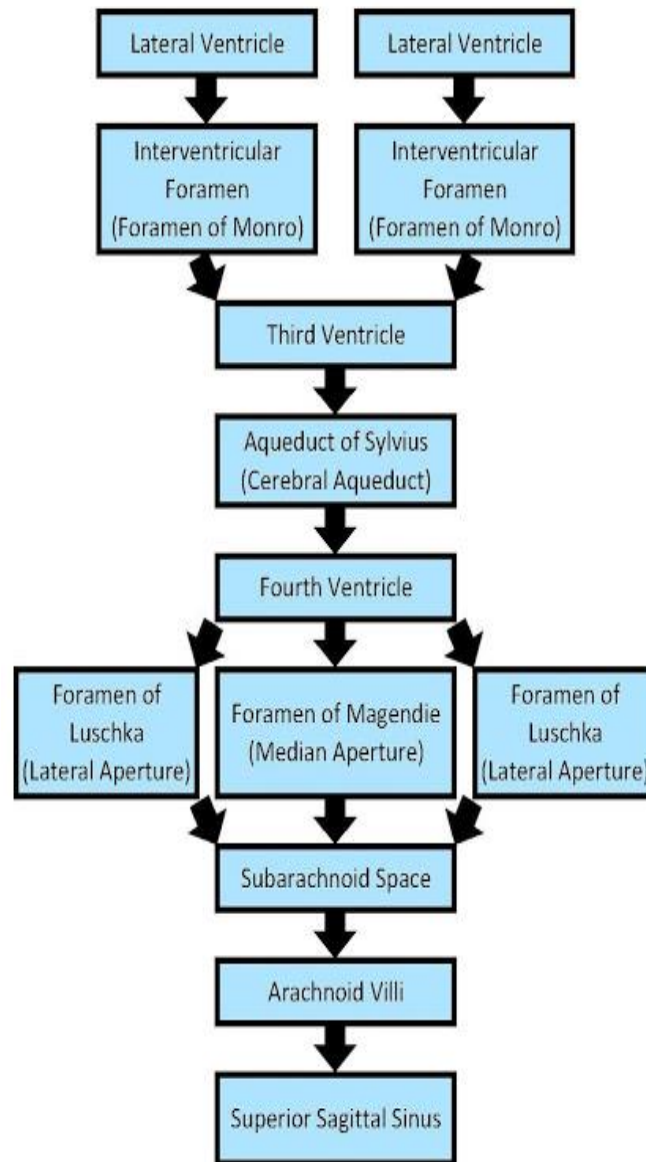
- Anterior cerebral : frontal pole to parieto- occipital sulcus
- Post cerebral: area post. Sulcus and temporal lobe.
- Middle cerebral: temporal pole.

CSF

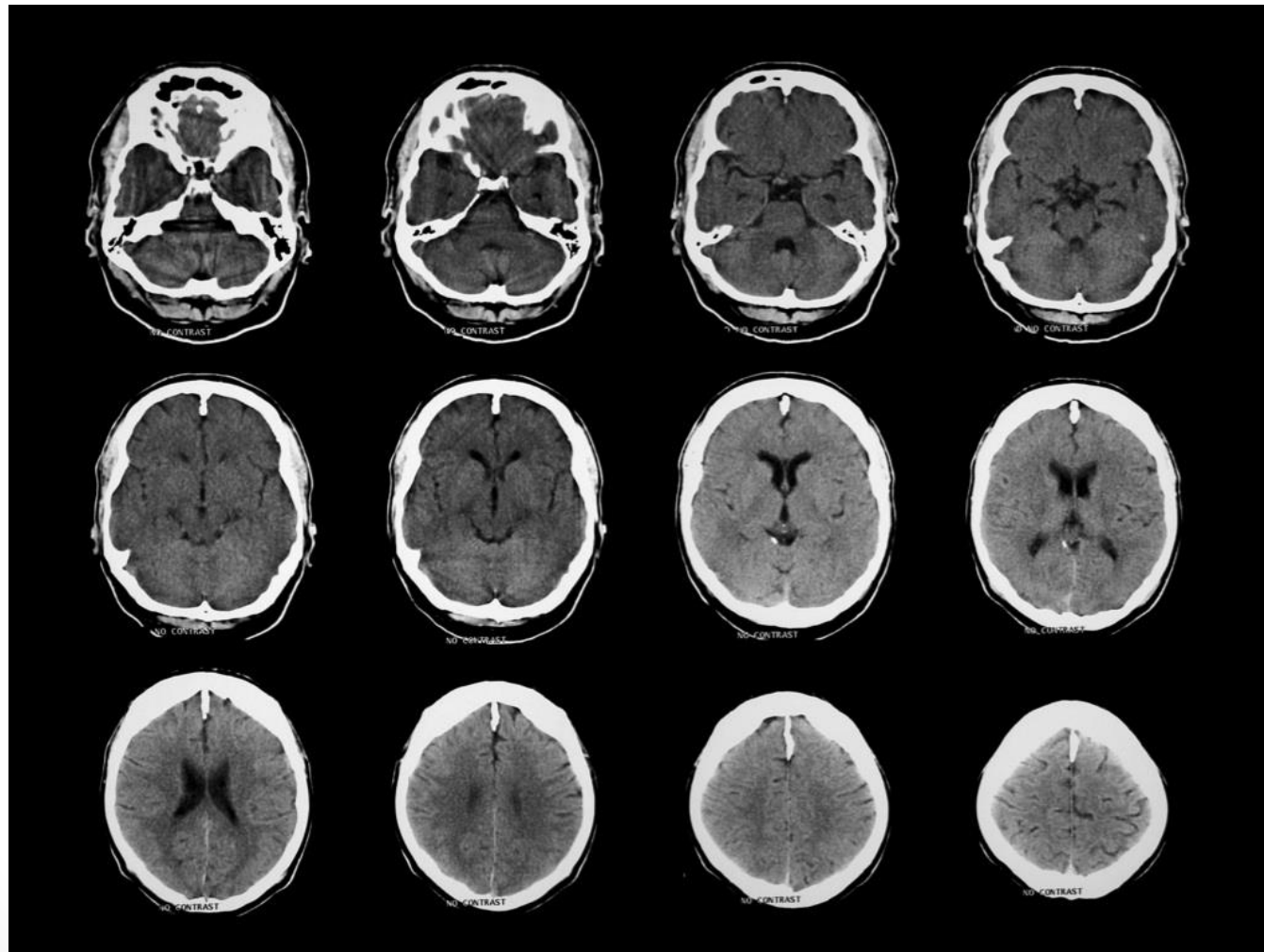


CSF

Circulation of Cerebrospinal Fluid (CSF)



C.T Brain



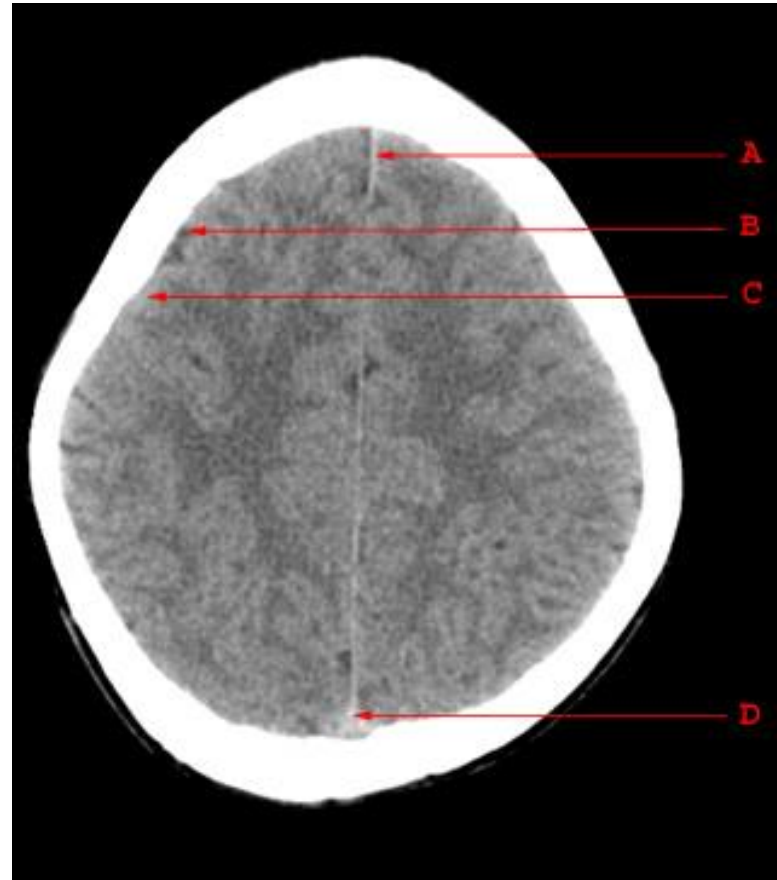
- Air is *very* black (less than -300 HU)
- Water/CSF is black (near 0 HU)
- Brain is gray 35-50 HU
- Blood is white (60-80 HU)
- Bone is *very* dense/white (500-3000 HU)

Normal CT brain



Normal CT Brain

- A. Falx Cerebri
- B. Sulcus
- C. Gyrus
- D. Superior Sagittal Sinus



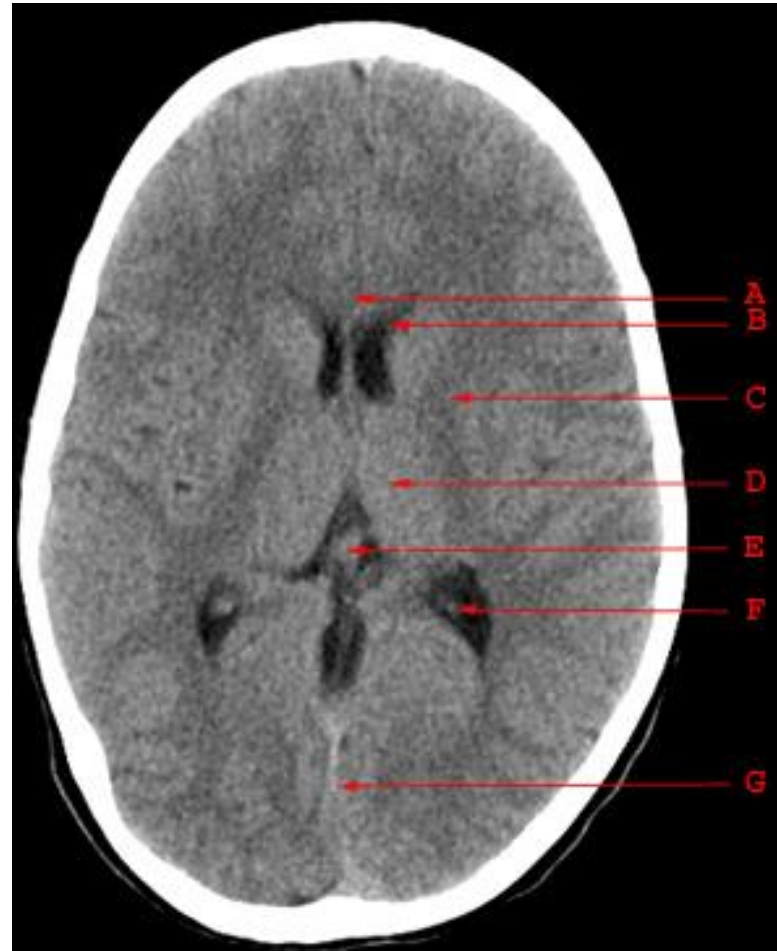
Normal CT Brain

- A. Falx Cerebri
- B. Frontal Lobe
- C. Body of the Lateral Ventricle
- D. Splenium of the Corpus Callosum
- E. Parietal Lobe
- F. Occipital Lobe
- G. Superior Sagittal Sinus



Normal CT Brain

- A. Genu of the Corpus Callosum
- B. Anterior Horn of the Lateral Ventricle
- C. Internal Capsule
- D. Thalamus
- E. Pineal Gland
- F. Choroid Plexus
- G. Straight Sinus



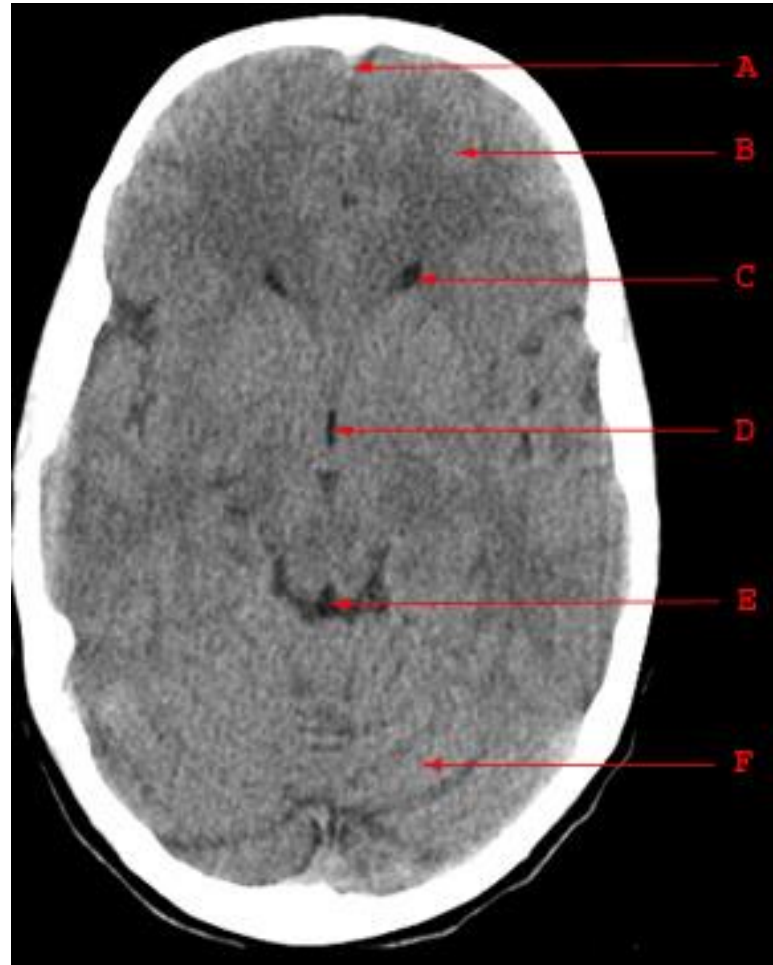
Normal CT Brain

- A. Anterior Horn of the Lateral Ventricle
- B. Caudate Nucleus
- C. Anterior Limb of the Internal Capsule
- D. Putamen and Globus Pallidus (lentiform nucleus)
- E. Posterior Limb of the Internal Capsule
- F. Third Ventricle
- G. Quadrigeminal Plate Cistern
- H. Cerebellar Vermis
- I. Occipital Lobe



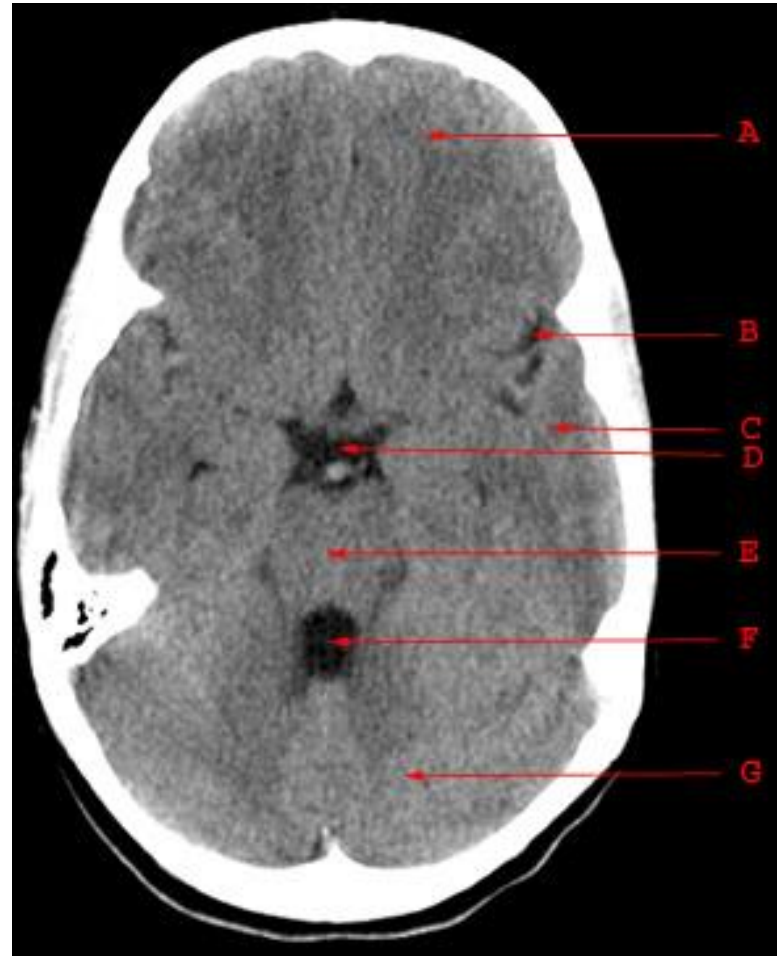
Normal CT Brain

- A. Falx Cerebri
- B. Frontal Lobe
- C. Anterior Horn of Lateral Ventricle
- D. Third Ventricle
- E. Quadrigeminal Plate Cistern
- F. Cerebellum



Normal CT Brain

- A. Frontal Lobe
- B. Sylvian Fissure
- C. Temporal Lobe
- D. Suprasellar Cistern
- E. Midbrain
- F. Fourth Ventricle
- G. Cerebellar Hemisphere



Normal CT Brain

- A. Frontal Lobe
- B. Frontal Bone (Superior Surface of Orbital Part)
- C. Dorsum Sellae
- D. Basilar Artery
- E. Temporal Lobe
- F. Mastoid Air Cells
- G. Cerebellar Hemisphere



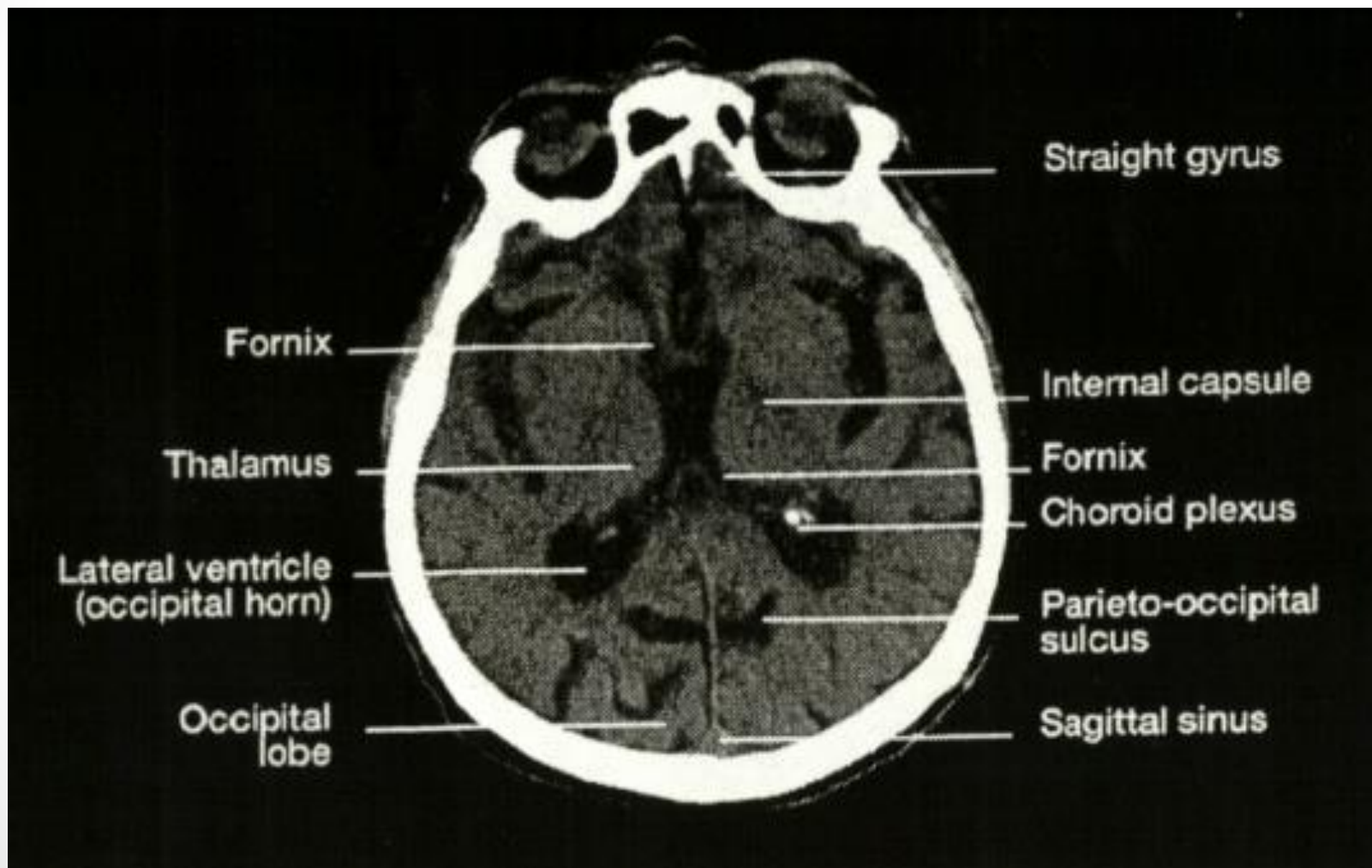
Normal CT Brain

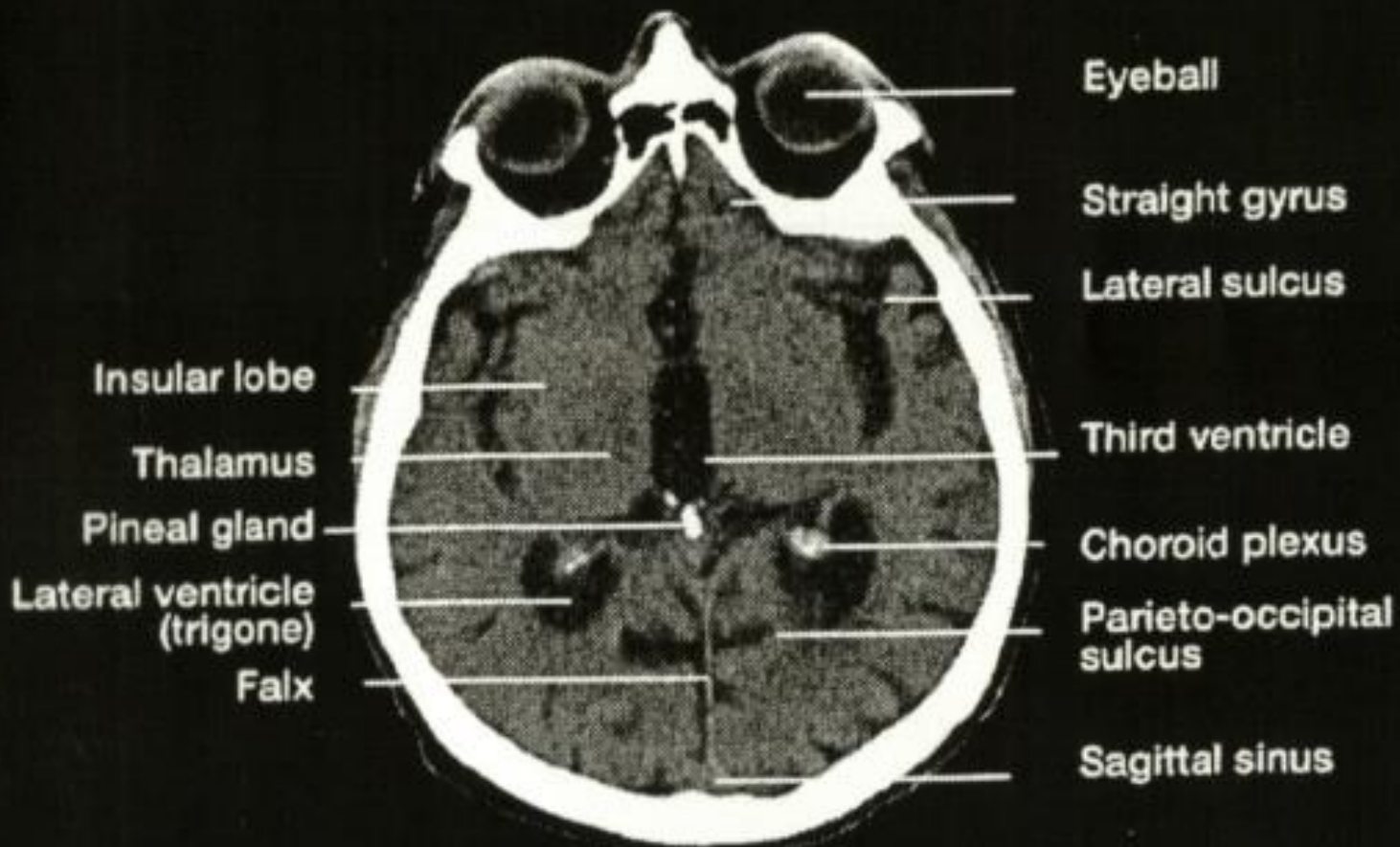
- A. Orbit
- B. Sphenoid Sinus
- C. Temporal Lobe
- D. External Auditory Canal
- E. Mastoid Air Cells
- F. Cerebellar Hemisphere

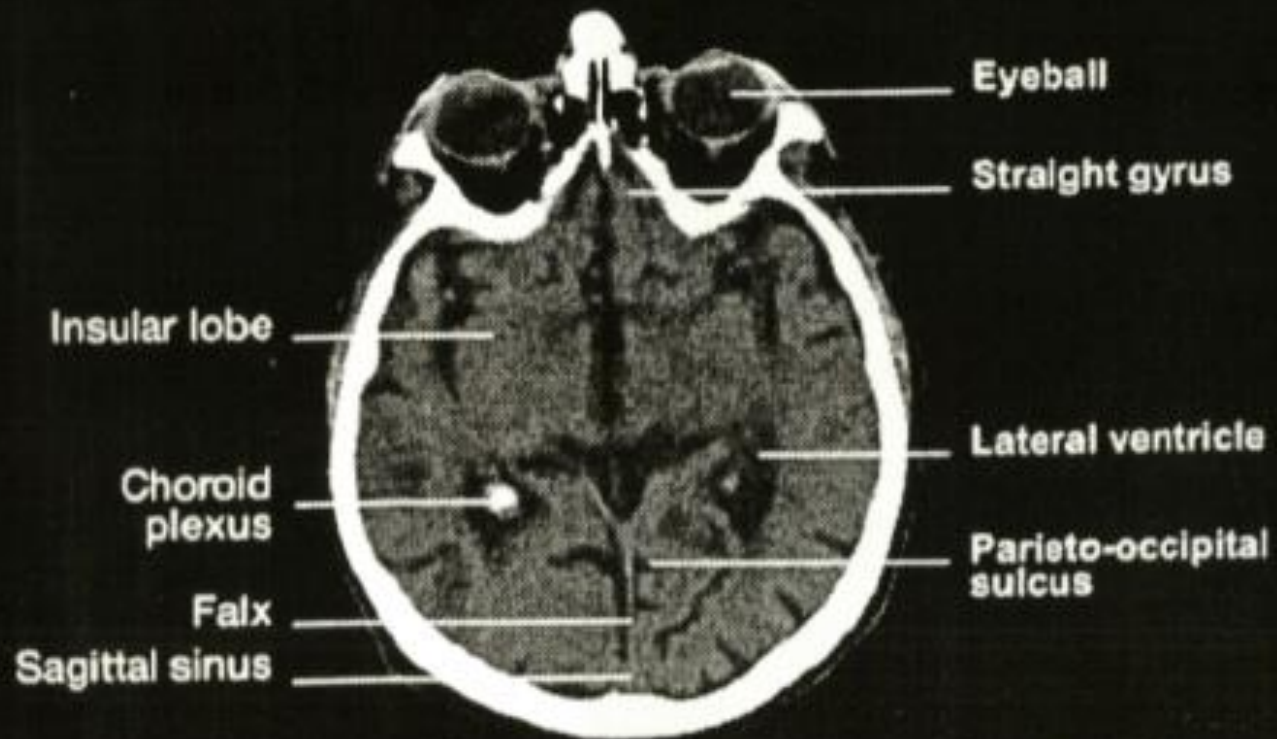


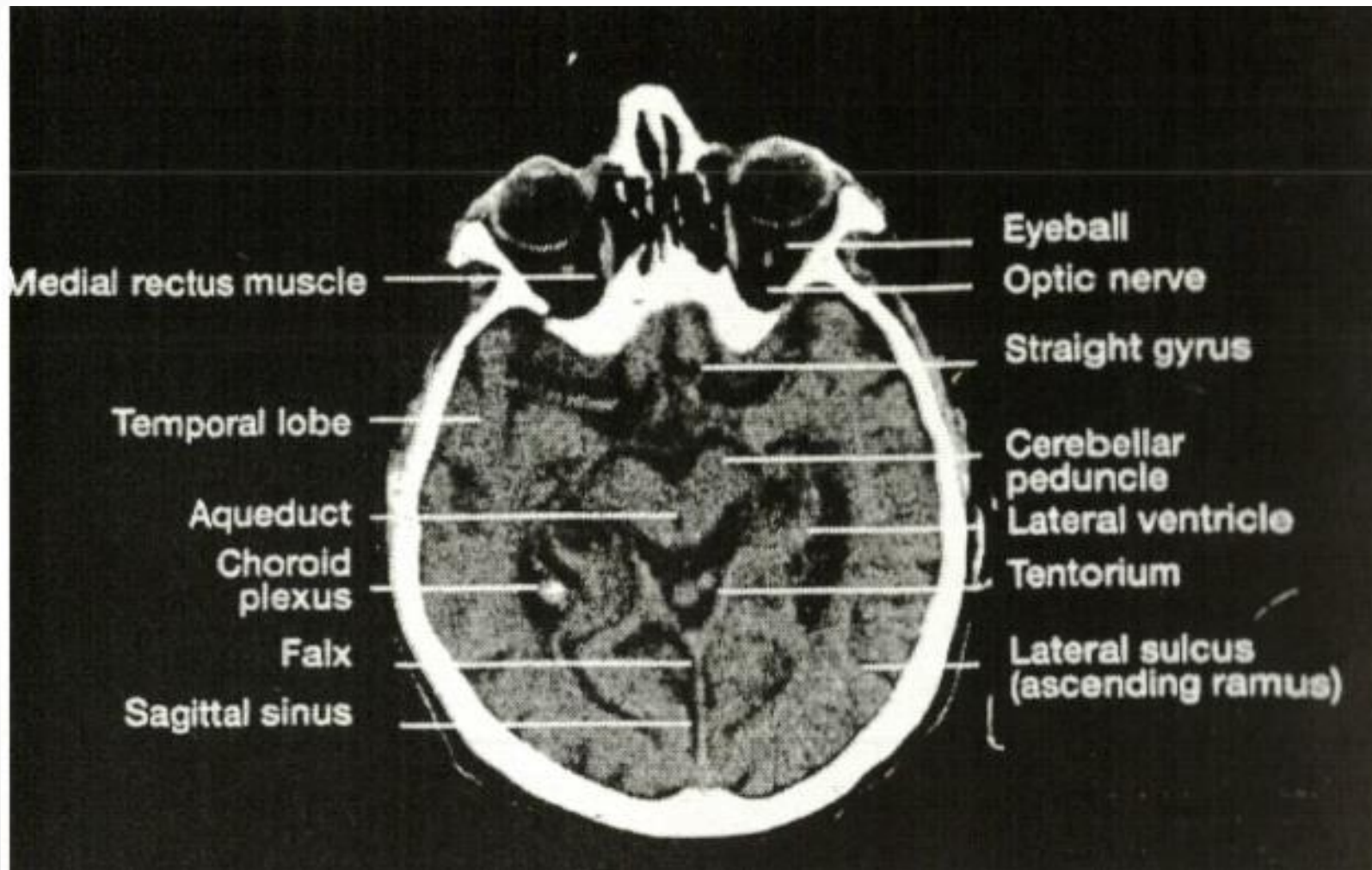
Normal CT Brain

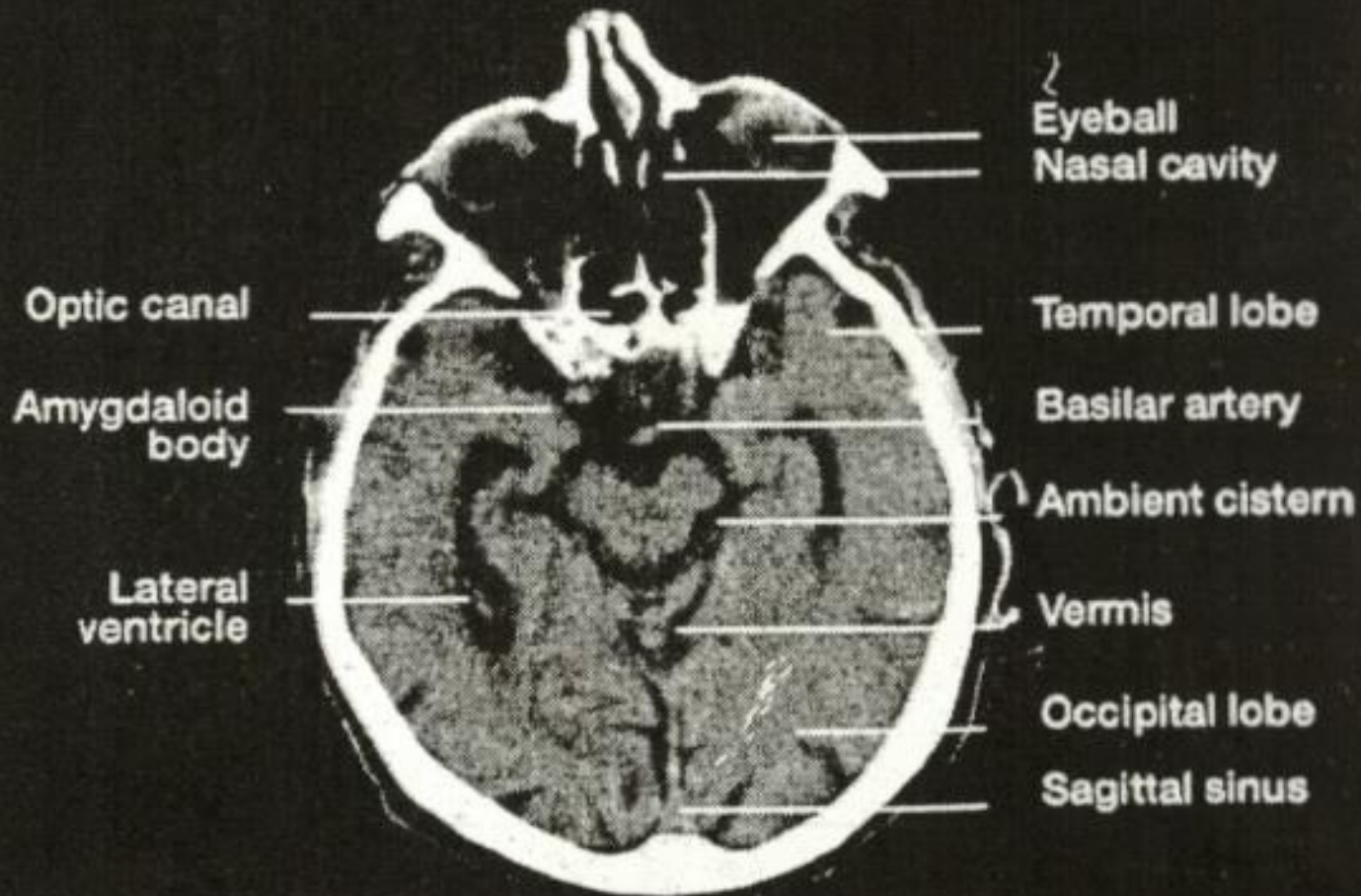


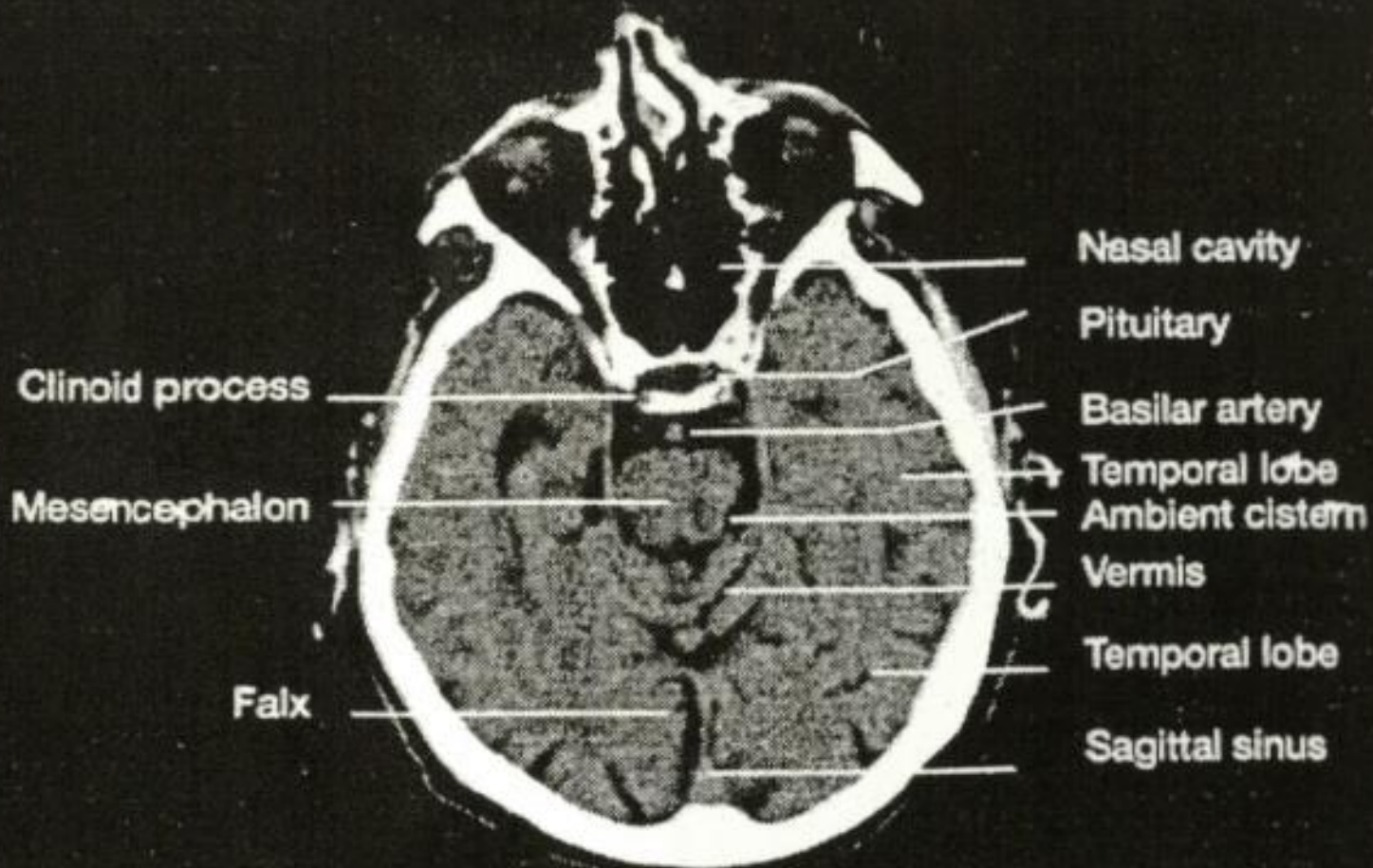












Hippocampus

Aqueduct

Ethmoid air cells

Pituitary

Temporal lobe

Ambient cistern

Cerebellum

Temporal lobe

Sagittal sinus



Maxillary sinus

Nasal septum

Sphenoid
sinus

Pons

Fourth ventricle

Temporal lobe

Basilar artery

Pedunculo-
cerebellar cistern

Cerebellum

Occipital lobe



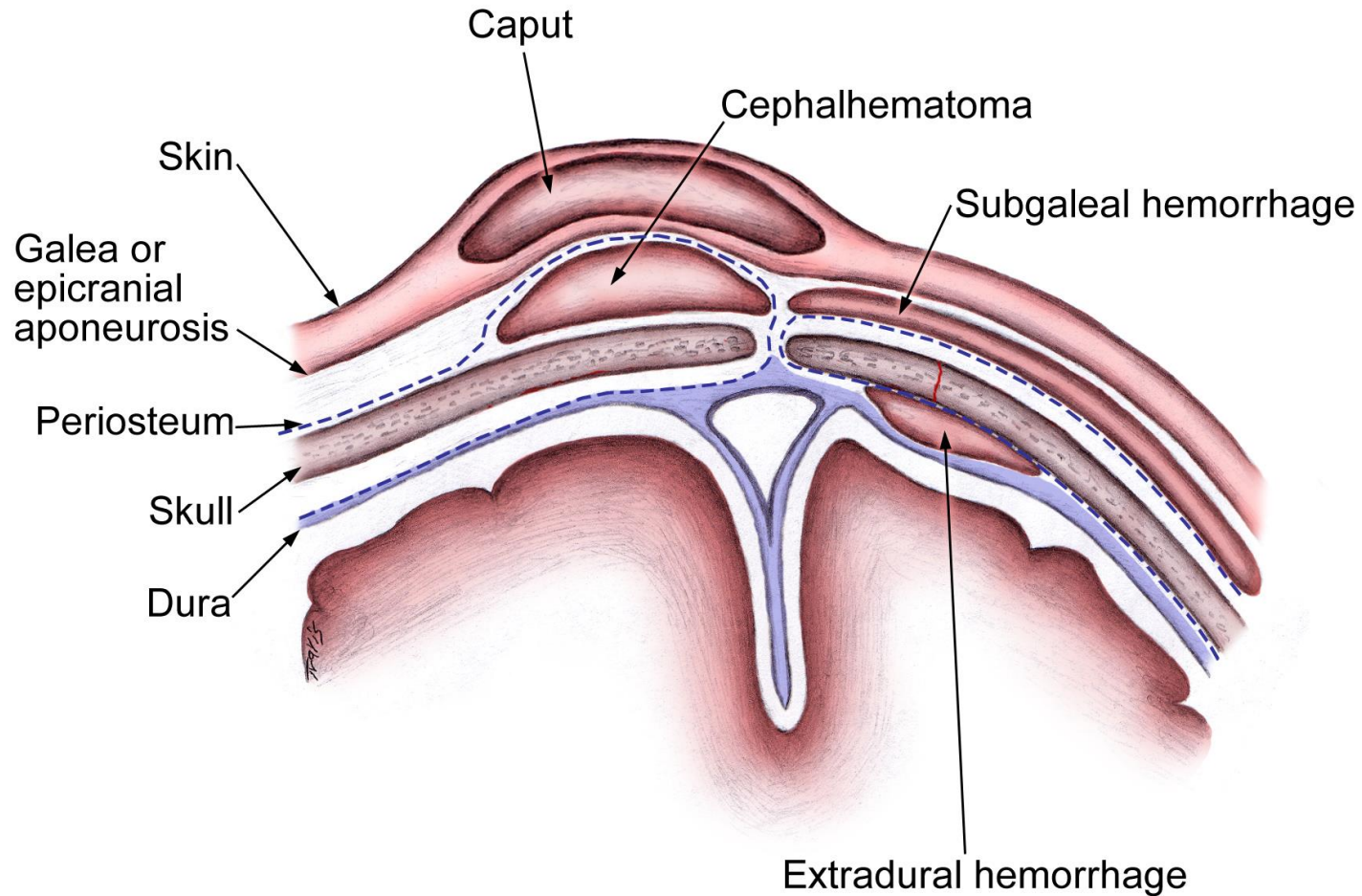
Blood Can Be Very Bad.

B - blood C - cisterns B - brain V -
ventricles B - bones

Blood

- Acute (less than 1 w) : appear white on CT (as bone), due to density of hemoglobin.
- Subacute (1-3 w): appear grey (as brain).
- Chronic (more than 3 w): appear black (as C.S.F).

Blood

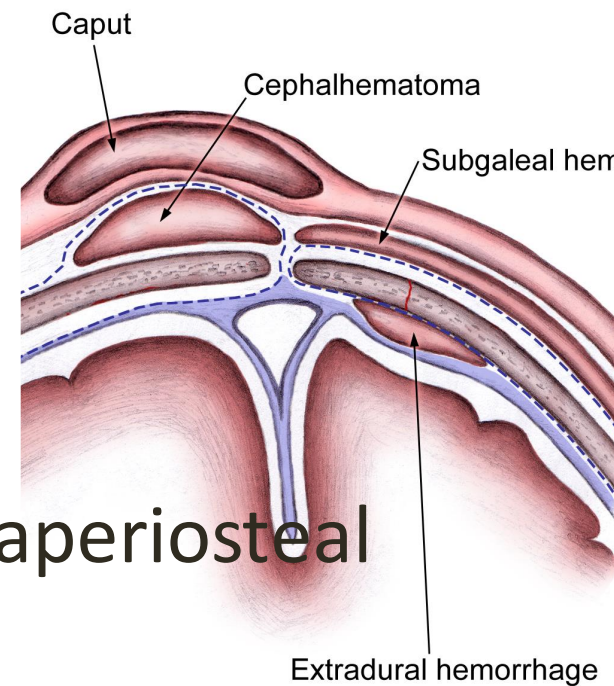


Types of hematomas:

- Caput succedaneum : subcutaneus
- Subgaleal hematoma: between skin and periosteum
- Cephalohematoma: between periosteum and skull
- Epidural (extradural): between skull and dura
- Subdural: between dura and brain

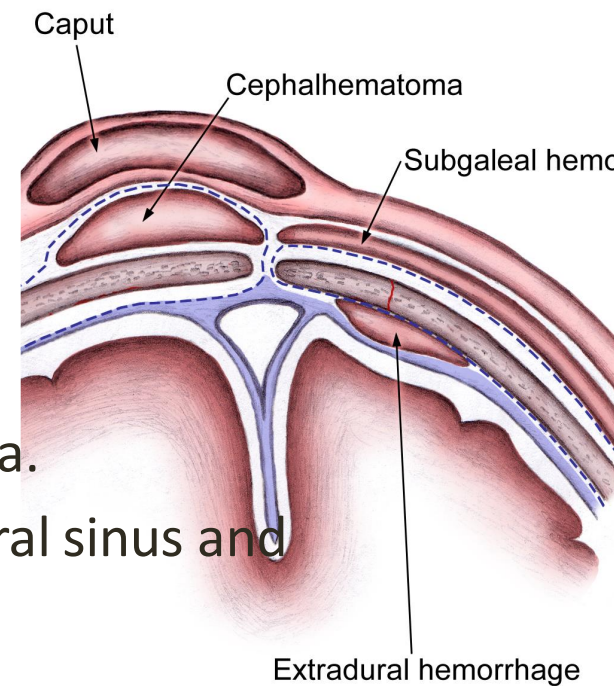
Caput succedaneum

- Def: neonatal condition involving serosanguinous subcutaneous extraperiosteal fluid collection.
- Cause: pressure of scalp against dilated cervix during delivery.
- Symptoms: presented by scalp swelling
- Management: observation only, resolve within few days.



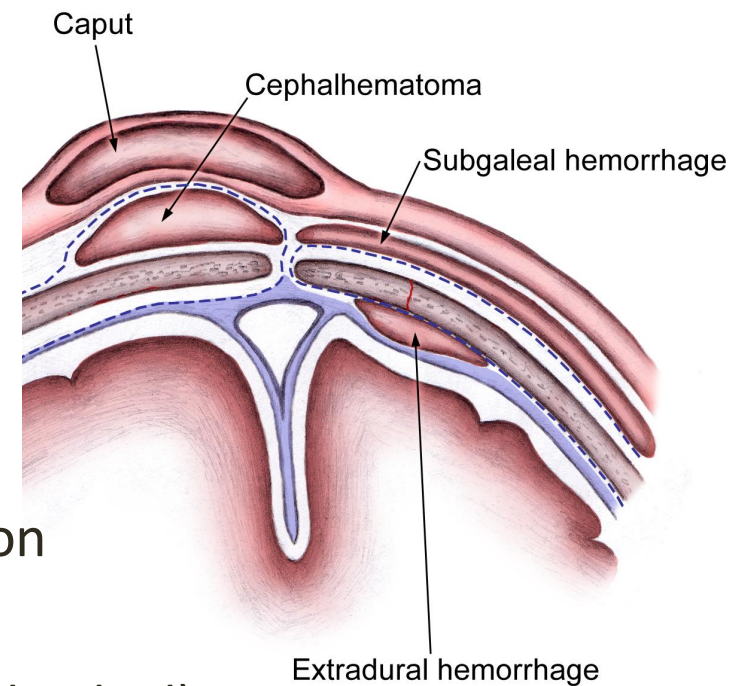
Subgaleal hematoma

- Def: between scalp and periosteum.
- Cause: ventouse assisted delivery , head trauma.
- Origin: rupture of emissary veins (between dural sinus and scalp veins)
- Character:
 - May cause raccoon eye
 - Cross suture line (unlike cephalohematoma)
- Management:
 - Observation for: hyperbilirubinemia, shock.
 - May need transfusion and phototherapy.



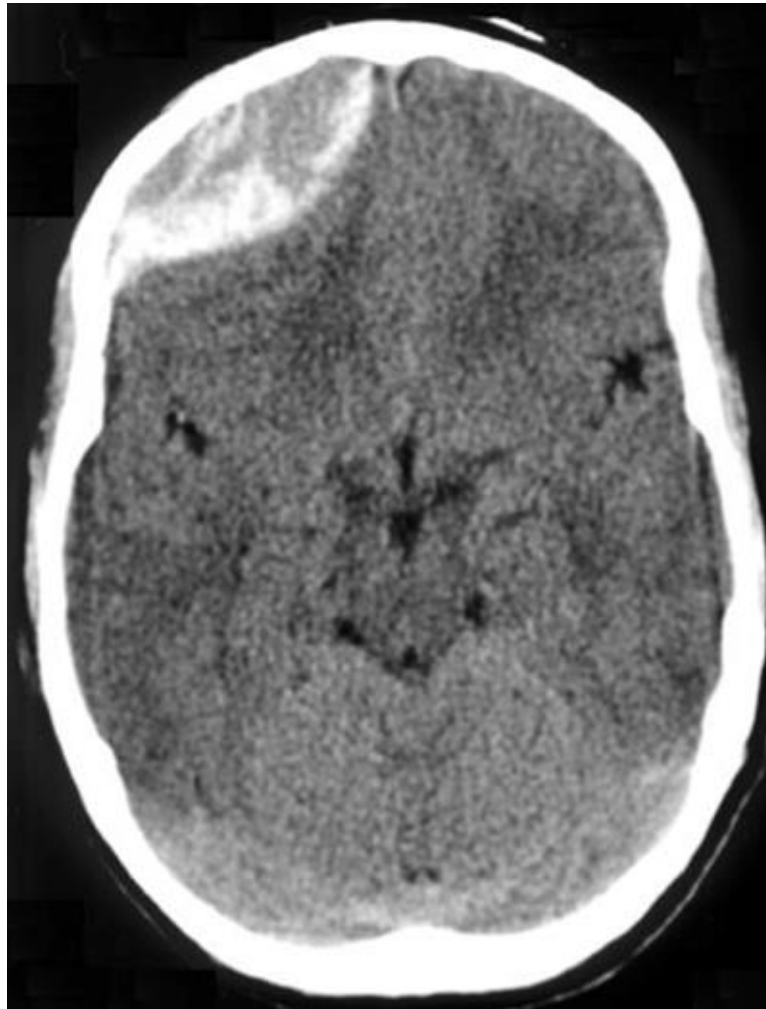
Cephalohematoma

- Site: between skull and periosteum
- Cause: prolonged second stage, ventouse
- Symptoms: jaundice, anaemia, hypotension
- Complication: osteomyelitis, meningitis
- Character: not cross suture line (unlike subgaleal)
- Management:
 - Observation for: hyperbilirubinemia, shock.
 - May need transfusion and phototherapy.
 - Takes months to resolve
 - Care about infection



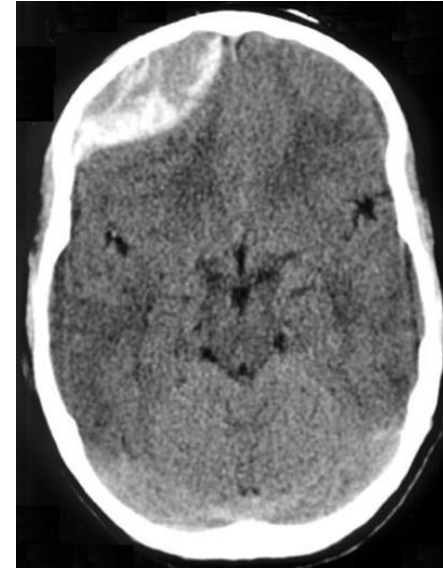
CAPUT SUCCEDANEUM	CEPHAL HAEMATOMA
1. Present at birth on normal vaginal delivery.	1. Appears within a few days after birth on normal or forceps delivery.
2. May lie on sutures, not well defined.	2. Well defined by suture, gradually developing, hard edge.
3. Soft, pits on pressure.	3. soft, elastic but does not pits on pressure.
4. Skin ecchymotic.	4. No skin change.
5. Size largest at birth , gradually subsides within a day.	5. Become largest after birth and then disappears within 6-8 weeks to few months.
6. No underlying skull bone fracture.	6. May underlying skull bone fracture.
7. No treatment required.	7. No treatment required.

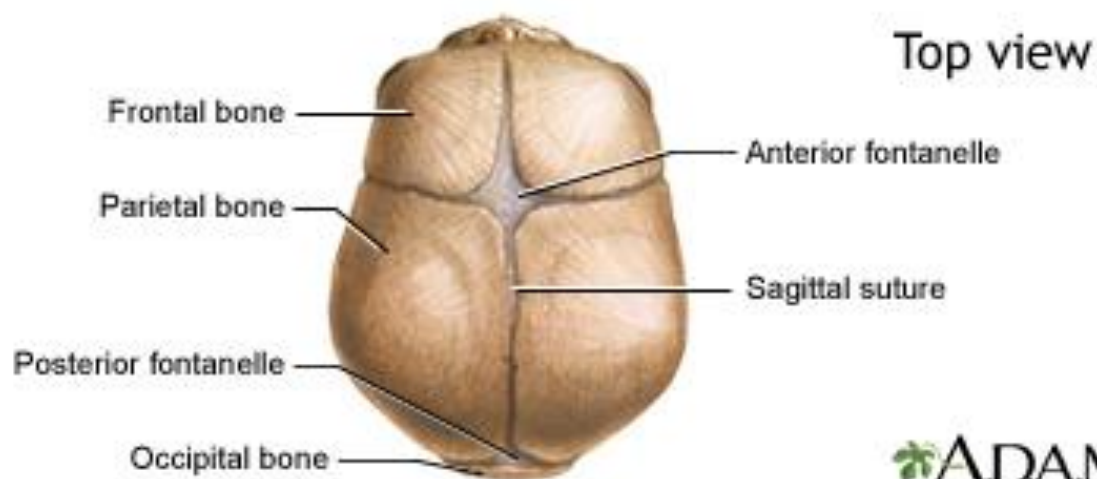
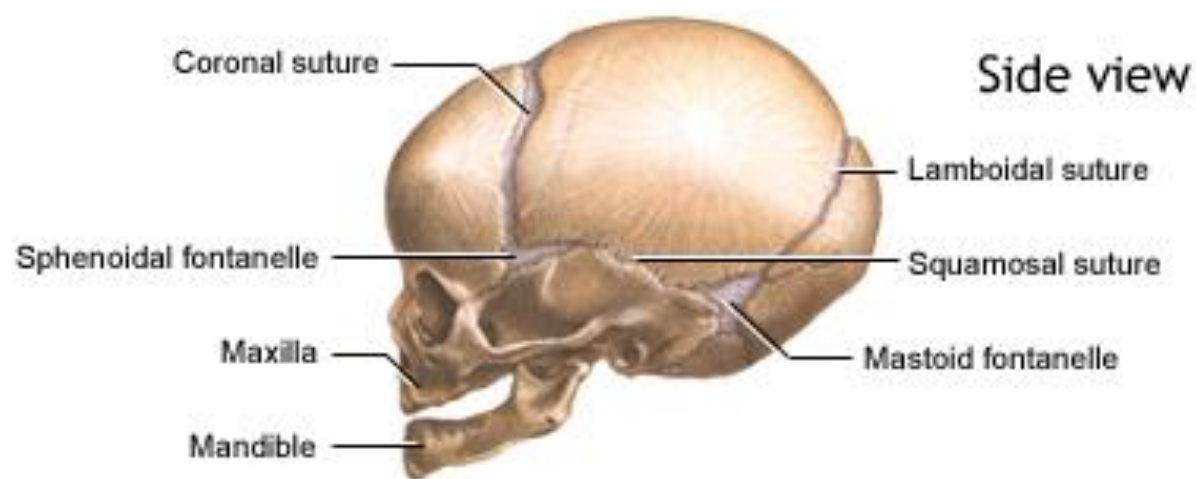
Epidural hematoma



Epidural hematoma

- Between skull and dura.
- lens-shaped (biconvex)
- not cross a suture line.
- Can pass midline (falx cerebri)
- arise primarily (85%) from arterial laceration due to a direct blow, with the middle meningeal artery the most common source.
- Occasionally, EDHs are due to damage to a venous sinus rather than an artery.
- Develop quickly (arterial origin).

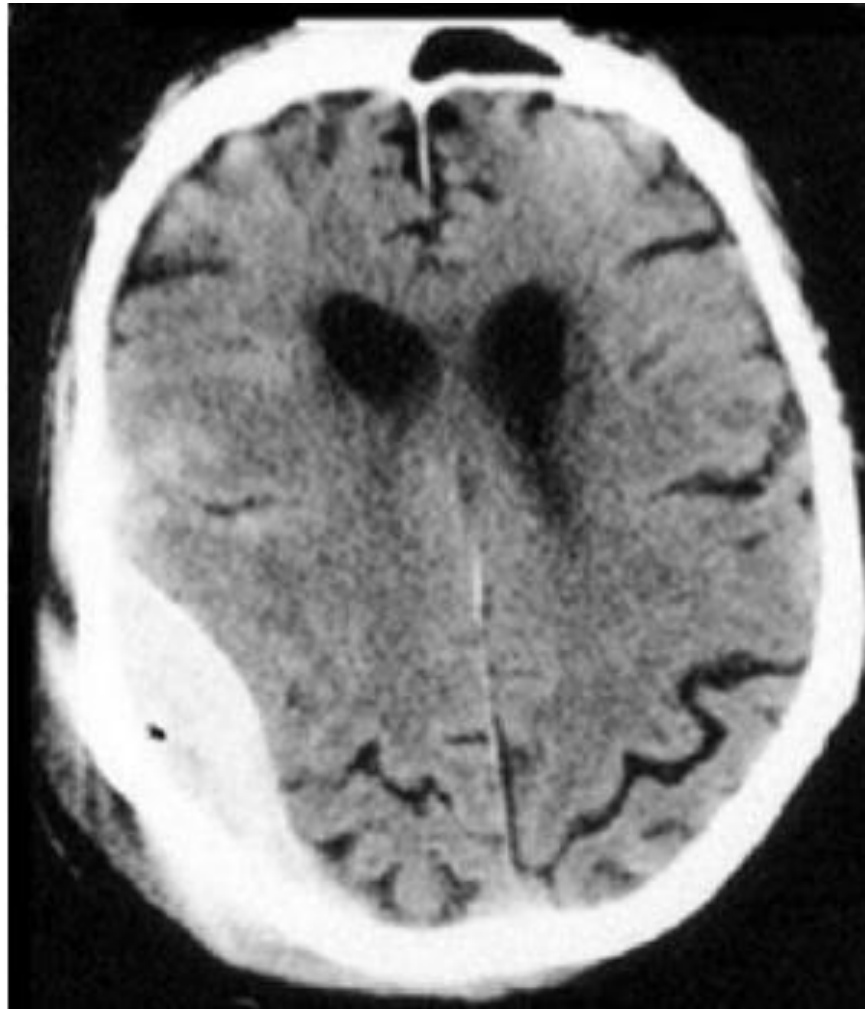






- Middle meningeal artery:
 - Branch of first part of the maxillary artery
 - Enter skull through foramen spinosum
 - Ascends between two dural layers.
 - Divide into anterior and posterior branch
 - Supply: most of dura and bone of skull vault.

Epidural hematoma



Epidural hematoma



Subdural hematoma

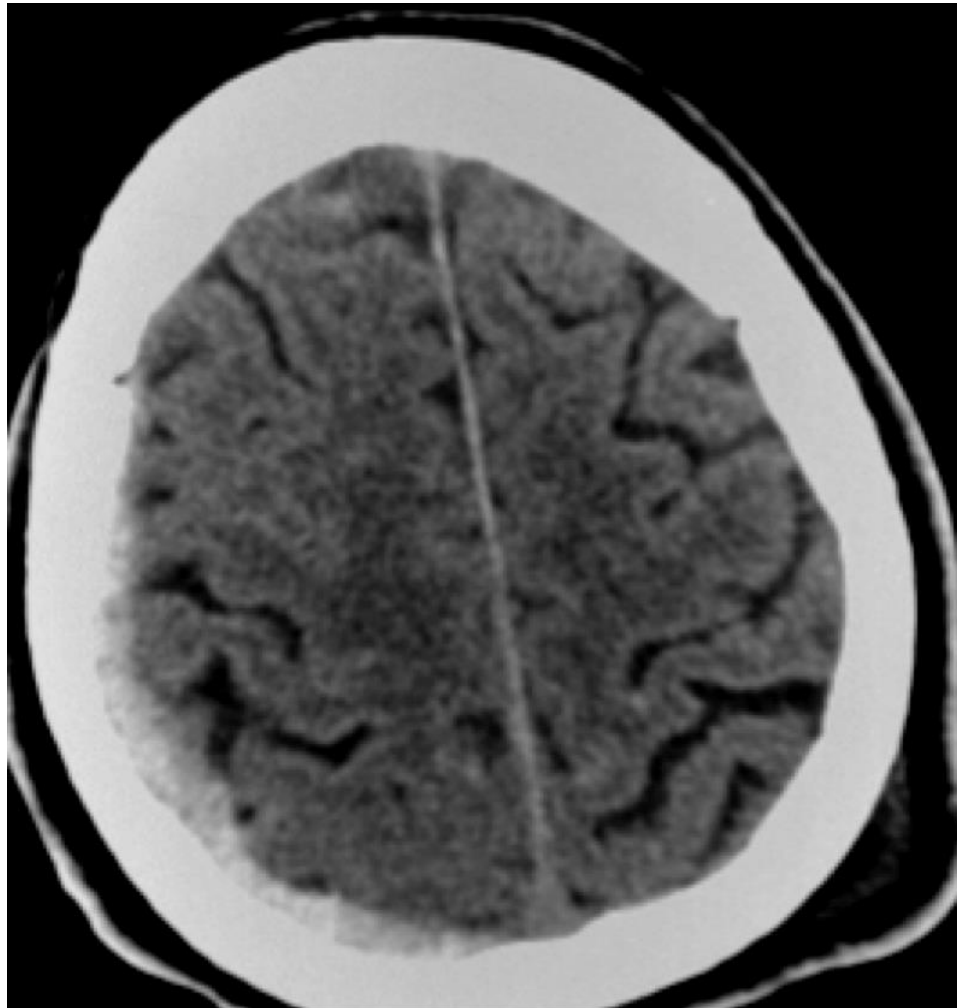


Subdural hematoma

- Between dura and arachnoid matter.
- sickle- or crescent-shaped
- Cross suture lines.
- Not pass midline (falx cerebri)
- arise from venous bleeding most commonly from tearing of bridging veins in subdural space.
- Develop gradually (venous origin).
- Acute or chronic.



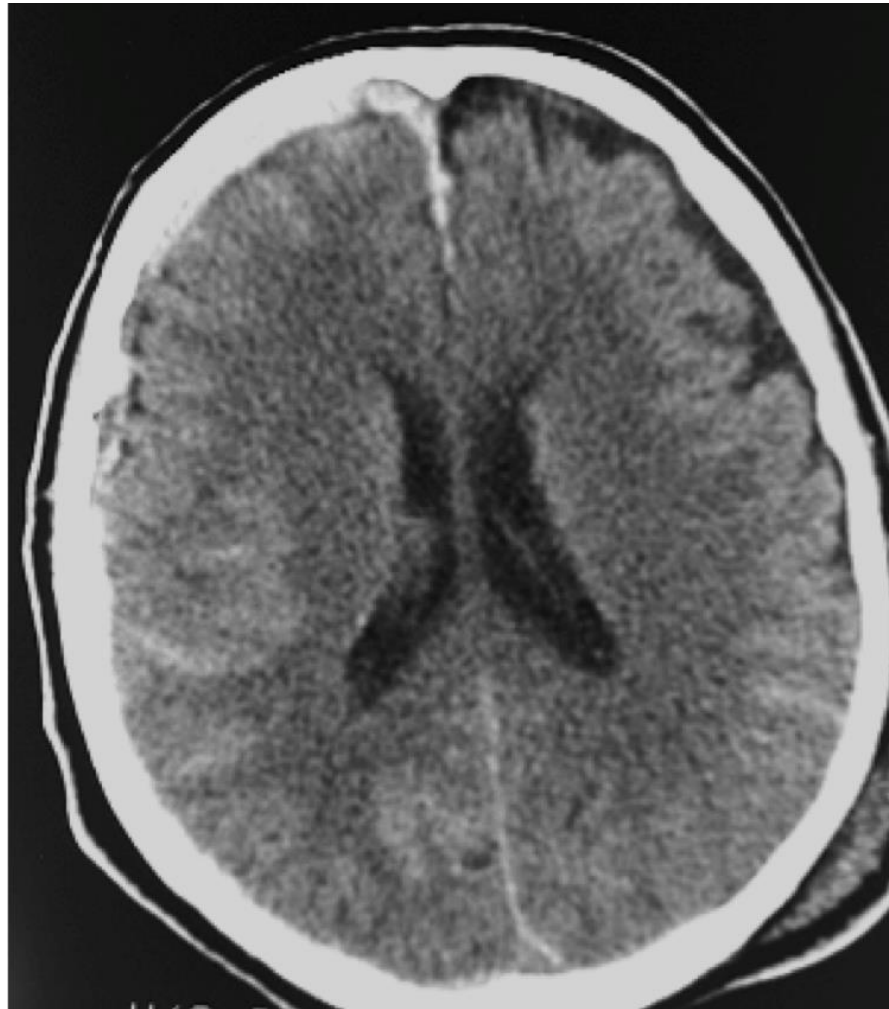
Subdural hematoma



Subdural hematoma



Subdural hematoma at midline



Subdural hematoma

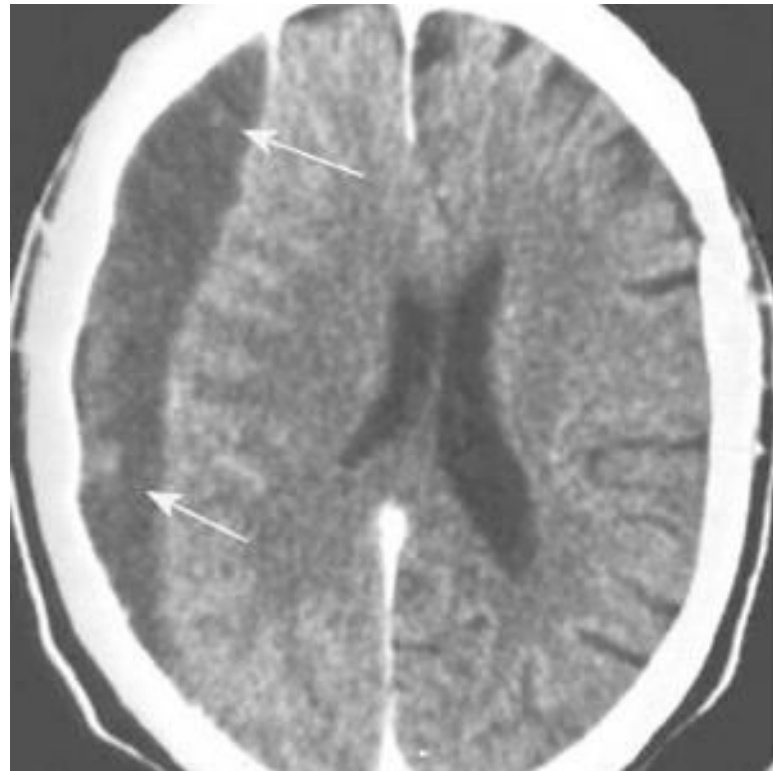
	acute	chronic
symptoms	Impaired conscious level Contralateral hemiparesis Ipsilateral mydriasis	Headache Dementia Unilateral deficits
cause	Sever brain injury	Mild trauma
P.F		Atrophy Friable vessel walls anticoagulant
Associated findings	Brain oedema contusions	No oedema No contusions
CT finding	Hyperdense mass	Homogenous hypodensity

Subdural hematoma

acute



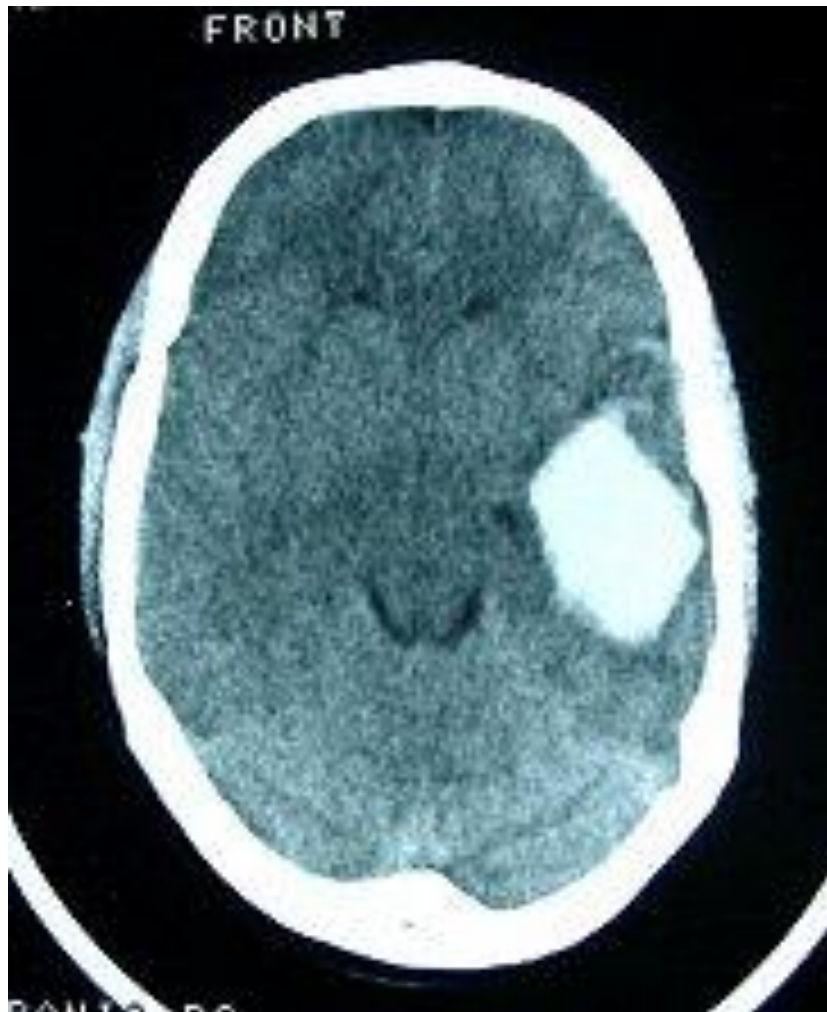
chronic



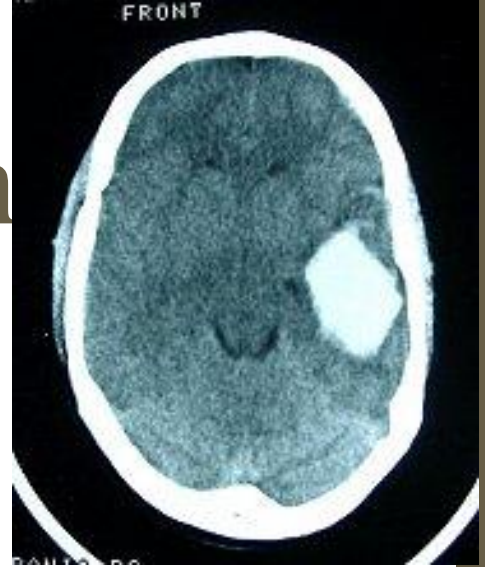
Intracerebral hematoma



Intracerebral hematoma

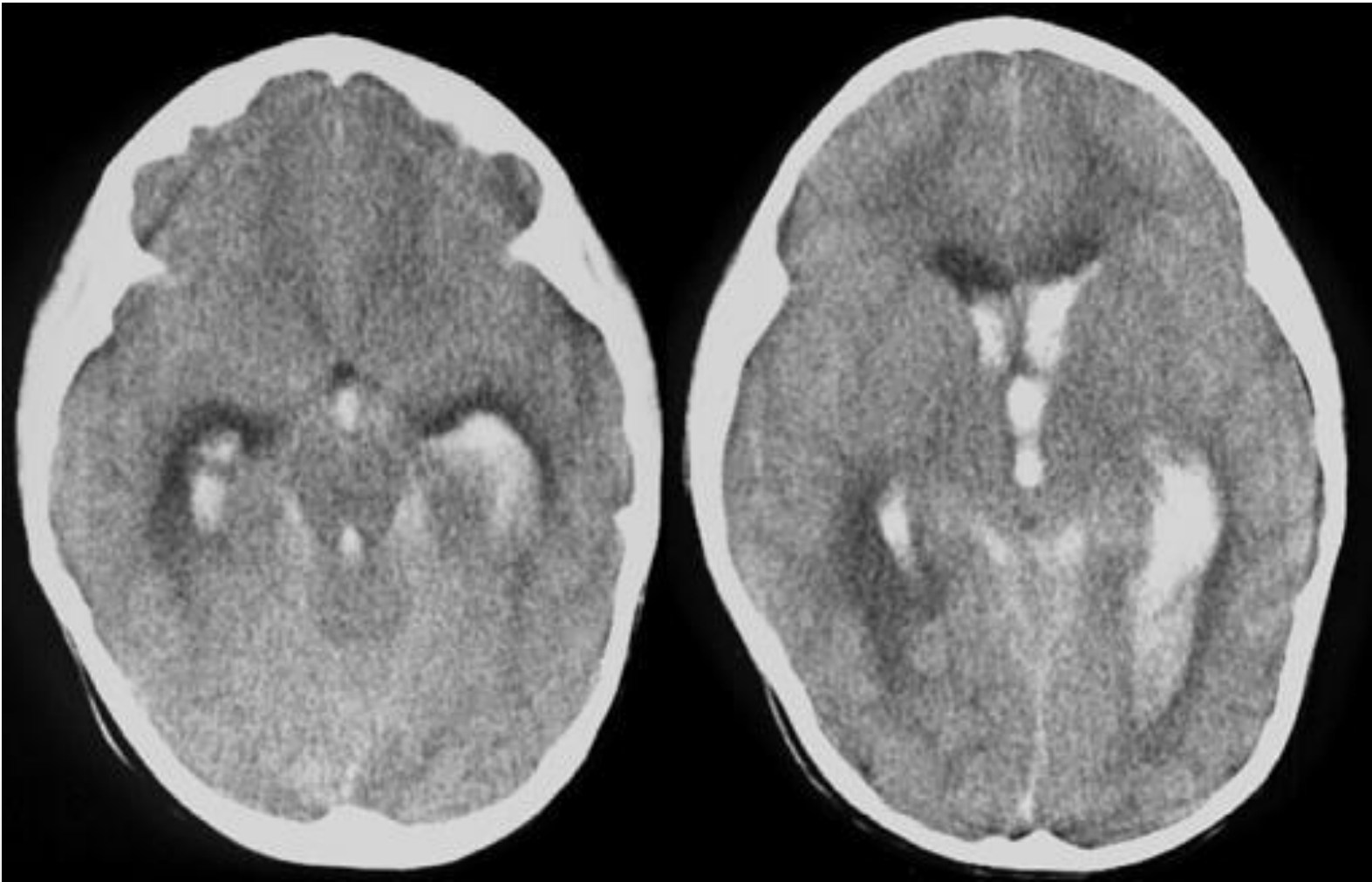


Intracerebral hematoma



- Common causes:
 - Hypertension:
 - Aneurysm
 - Arteriovenous malformation.
 - Trauma.
 - Anticoagulation.
 - Haemorrhagic transformation of an infarction.
- CT appear:
 - rounded homogeneous and hyperdense.
- Commonest sites:
 - around the lentiform nucleus, the thalamus and pons.

Interventricular hematoma



Interventricular hematoma

- Cause: traumatic or secondary to intraparenchymal hemorrhage or subarachnoid hemorrhage with ventricular rupture.
- CT : white density in the normally black ventricular spaces.
- Cerebrospinal fluid (CSF) is produced in the lateral ventricles at a rate of 0.5 to 1 mL per minute, and this will occur regardless of the intraventricular pressure.
- A block at any point in the CSF pathway will result in hydrocephalus, with associated increased intracranial pressure and herniation.

Interventricular hematoma



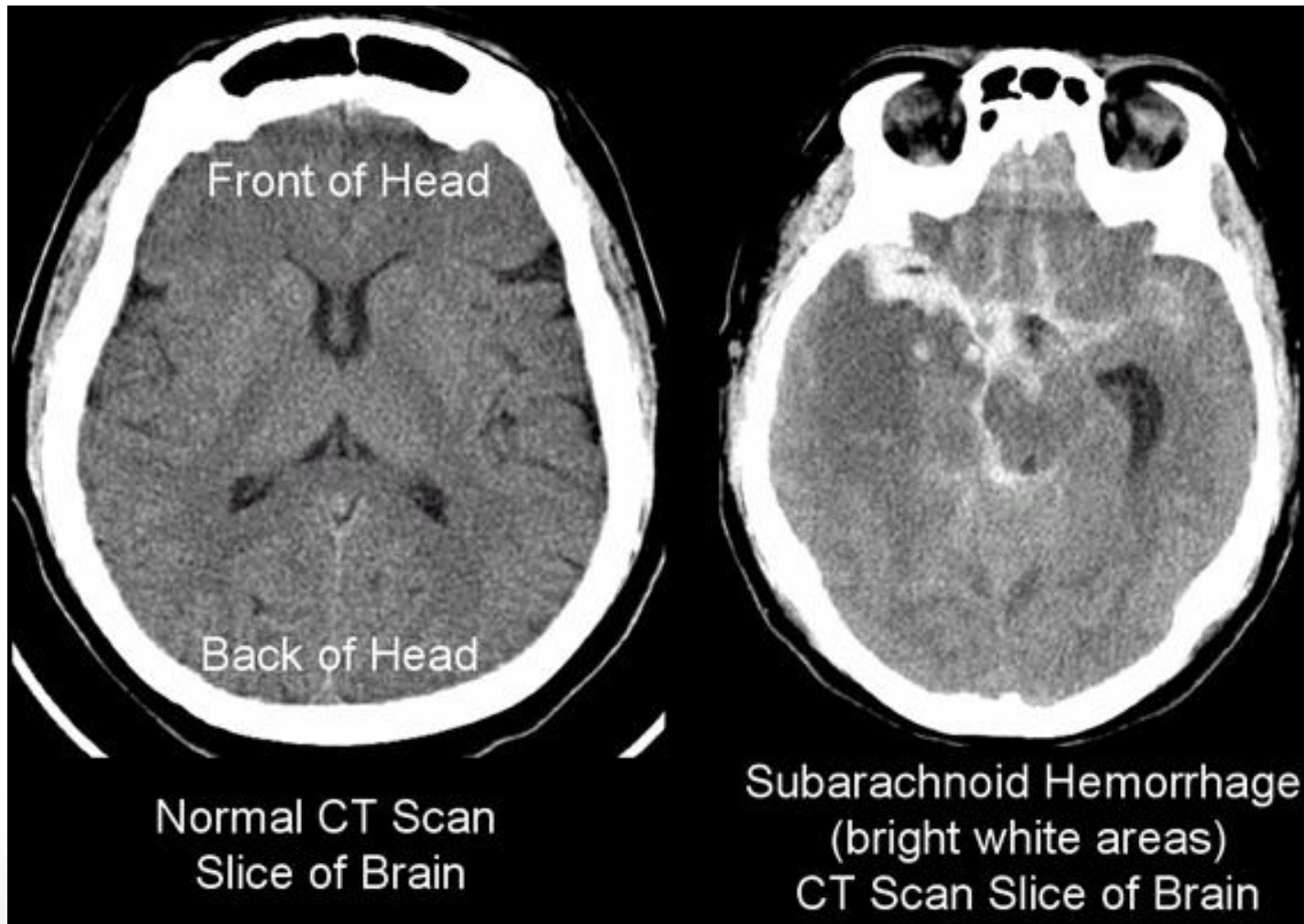
Subarachnoid hemorrhage

- Def: hemorrhage into any subarachnoid space that is normally filled with CSF (e.g., cistern, brain convexity).
- Cause: aneurysmal (75%- 80%), but it can also occur with trauma, tumor, arteriovenous malformations and dural malformations.
- Complication:
 - hydrocephalus from failure of absorption of CSF by the arachnoid villi.
 - Vasospasm, often in the second week, producing brain ischaemia or infarction
 - Very high rebleeding rate of up to 15% at 24 hours and 40% at 1 month if left untreated.

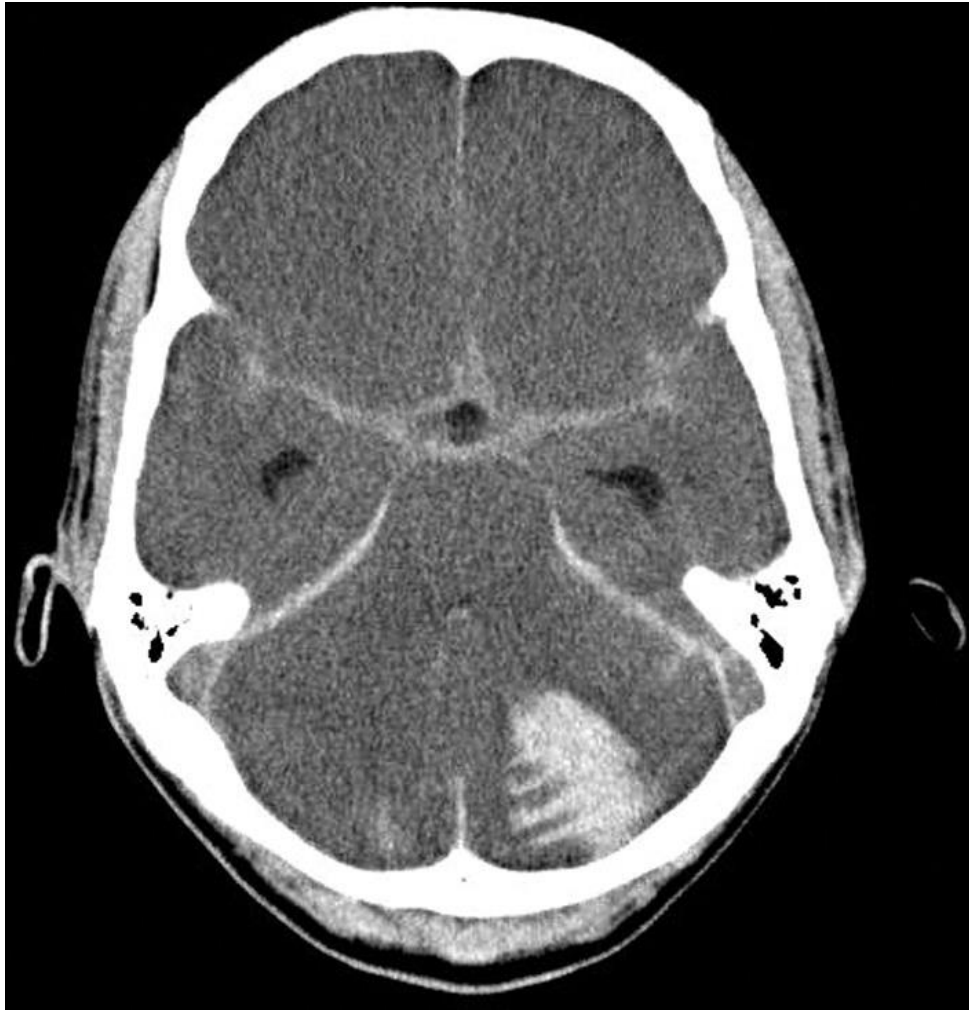
Subarachnoid hemorrhage



Subarachnoid hemorrhage



Subarachnoid hemorrhage



Subarachnoid hemorrhage



Blood Can Be Very Bad.

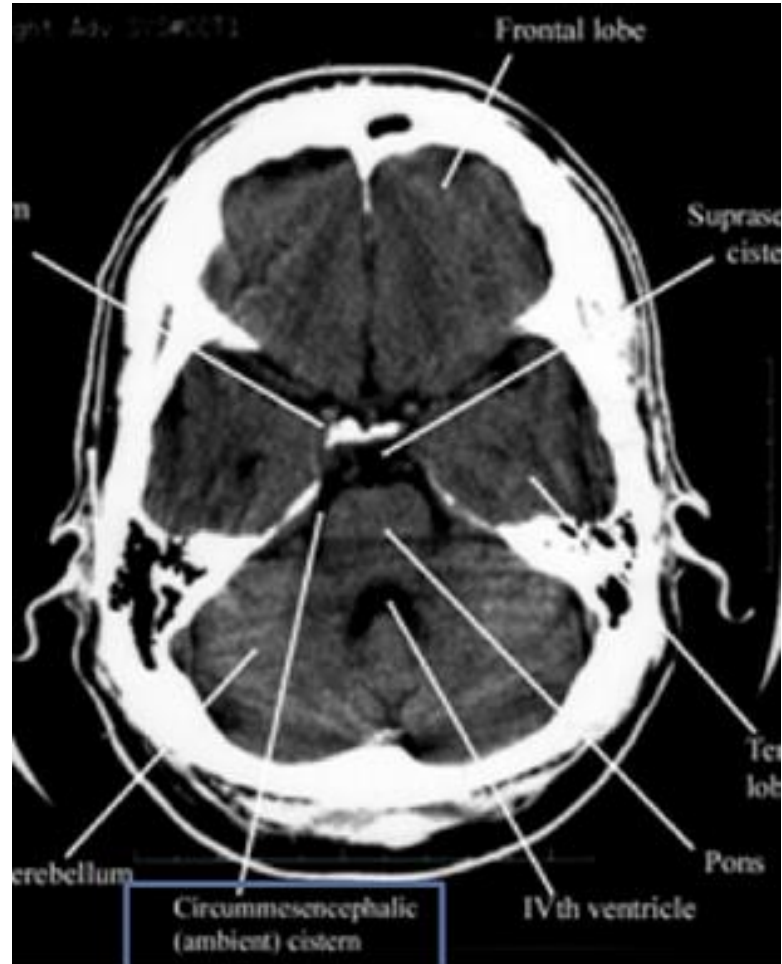
B - blood C - cisterns B - brain V -
ventricles B - bones

Cistern

- The pia mater adheres to the surface of the brain, closely following the contours of its gyri and sulci, but the arachnoid covers only its superficial surface.
- in certain areas around the brain the pia and arachnoid are separated widely; in such regions are formed cavities called the subarachnoid cisterns.
- Filled with CSF
- Major:
 - Circummesencephalic.
 - Suprasellar.
 - Quadrigeminal.
 - Sylvian.

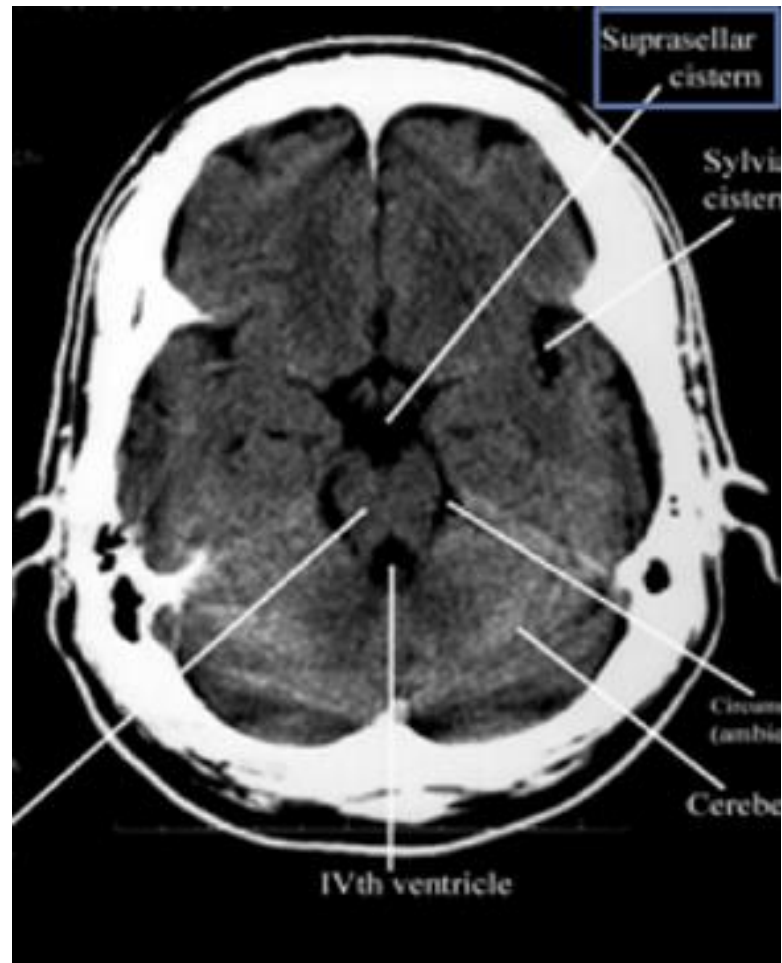
Circummesencephalic cistern:

- ring around the midbrain.
- most sensitive marker for increased intracranial pressure.
- affected first with increased pressure and herniation syndromes.



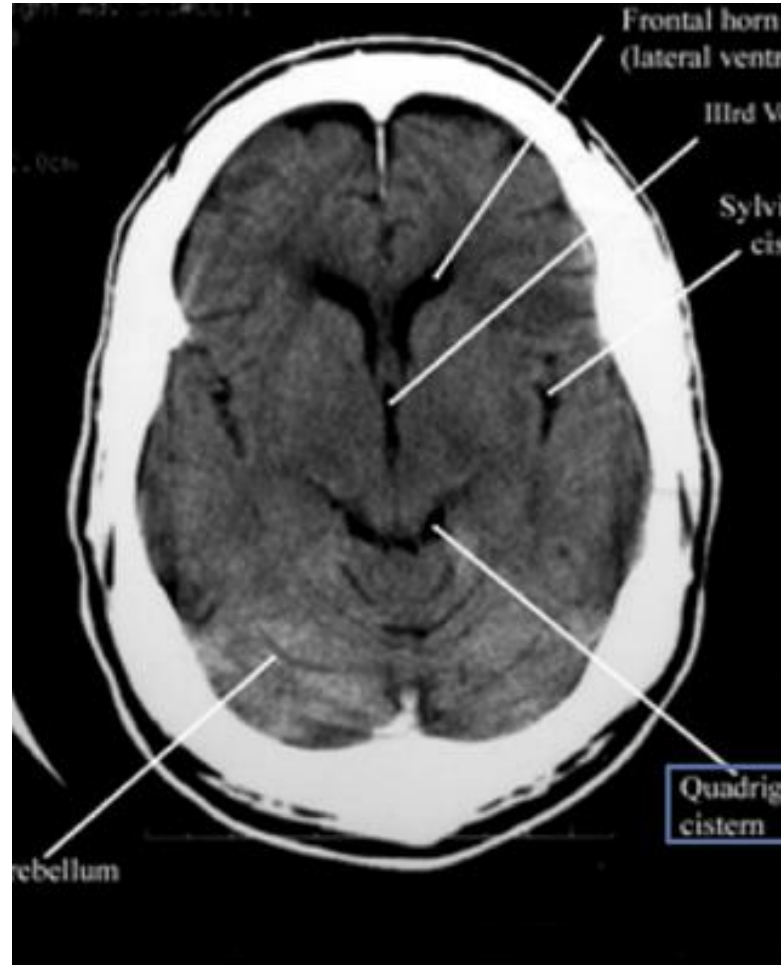
Suprasellar cistern:

- Star-shaped space above the sella and pituitary.
- an excellent location for identifying aneurysmal subarachnoid hemorrhage.



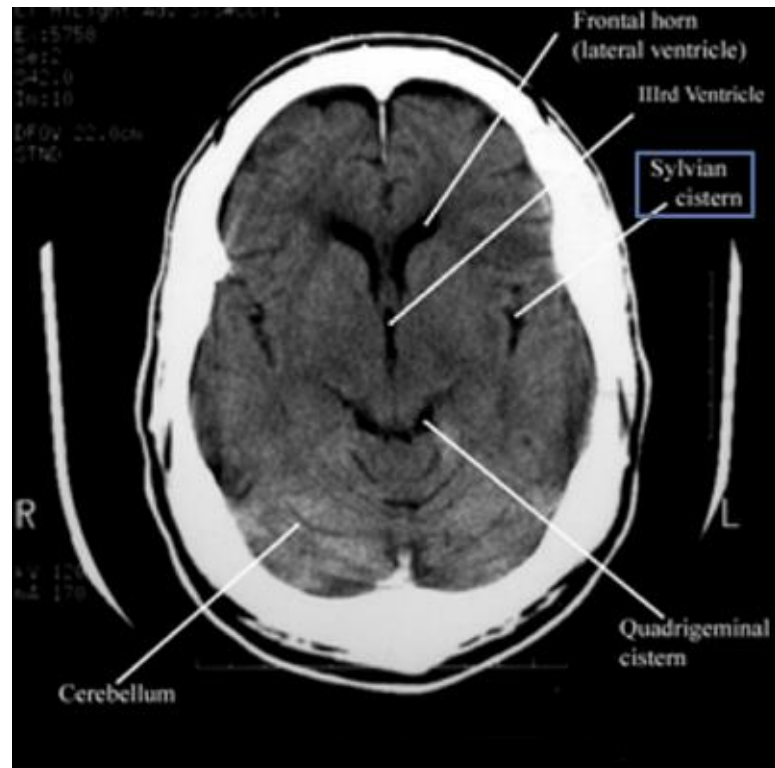
Quadrigeminal cistern:

- W-shaped cistern at the top of the midbrain.
- can be a location for identifying traumatic subarachnoid hemorrhage, as well as an early marker of increased intracranial pressure and rostrocaudal herniation



Sylvian cistern:

- Bilateral CSF space located between the temporal and frontal lobes of the brain.
- another good location to identify subarachnoid hemorrhage, whether caused by trauma or aneurysm leak (particularly distal middle cerebral artery aneurysms).



Blood Can Be Very Bad.

B - blood C - cisterns B - brain V -
ventricles B - bones

Brain

- Examine the brain for
- **Symmetry** - make sure sulci and gyri appear the same on both sides. (easiest when patient not rotated in the scanner)
- **Grey-white differentiation** - the earliest sign of a CVA on CT scan is the loss of the grey-white interface on CT scan. Compare side to side.
- **Shift** - the falx should be in the midline with ventricles the same on both sides. Check for effacement of sulci (unilateral or bilateral).
- **Hyper/hypodensity** - blood, calcification and IV contrast are hyperdense (appear lighter) and air, fat and areas of tumor ischemia are hypodense (appear darker).

Cerebral infarction



Cerebral infarction

- Character:
 - Hypodense area
 - loss of gray-white matter differentiation
 - loss of cortical sulci.
 - narrowing of the Sylvian fissure;
 - compression of ventricular system and cisterns

Distribution:

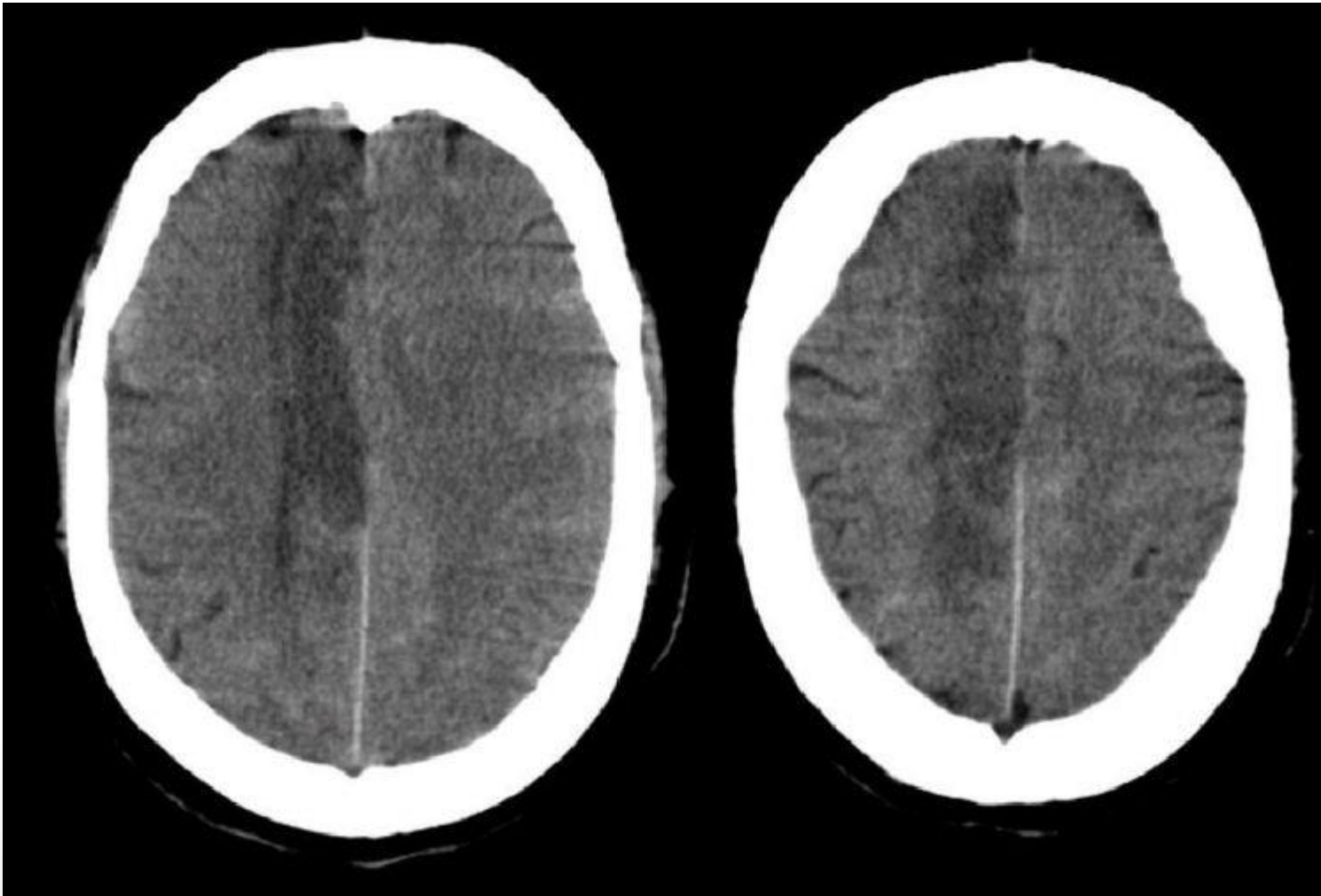
Anterior

Middle

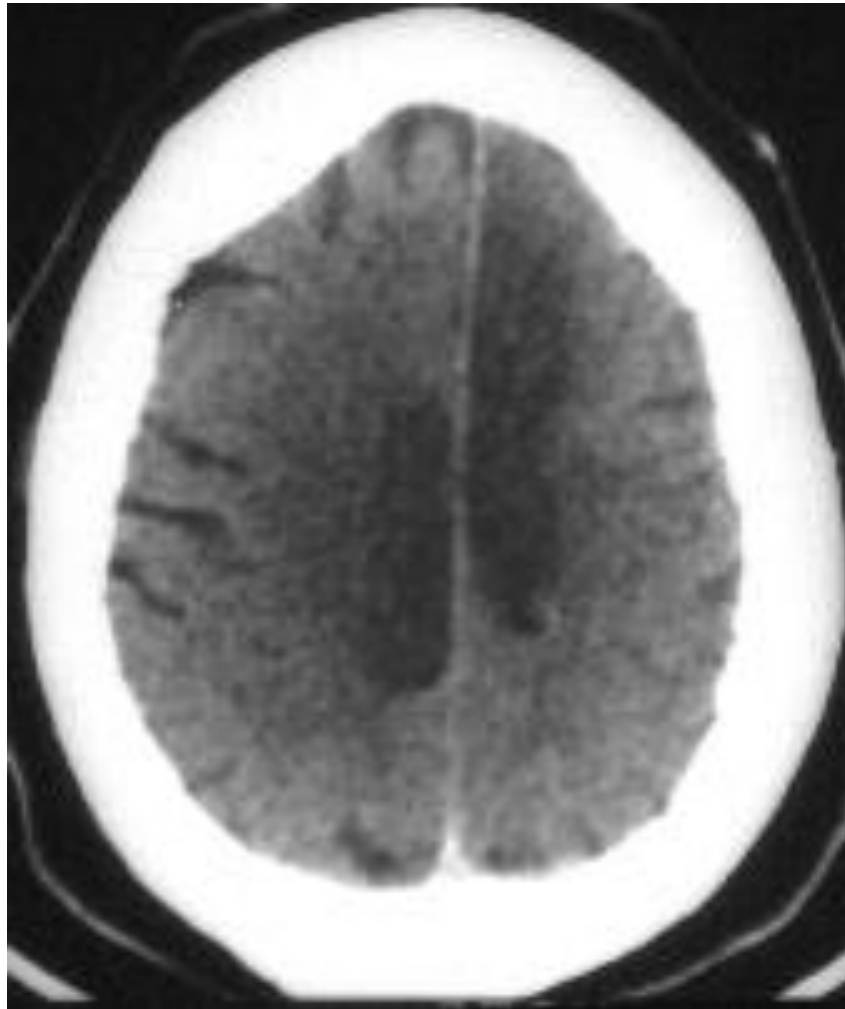
posterior



Cerebral infarction (ACA)



Cerebral infarction (ACA)



Cerebral infarction (MCA)



Cerebral infarction (PCA)



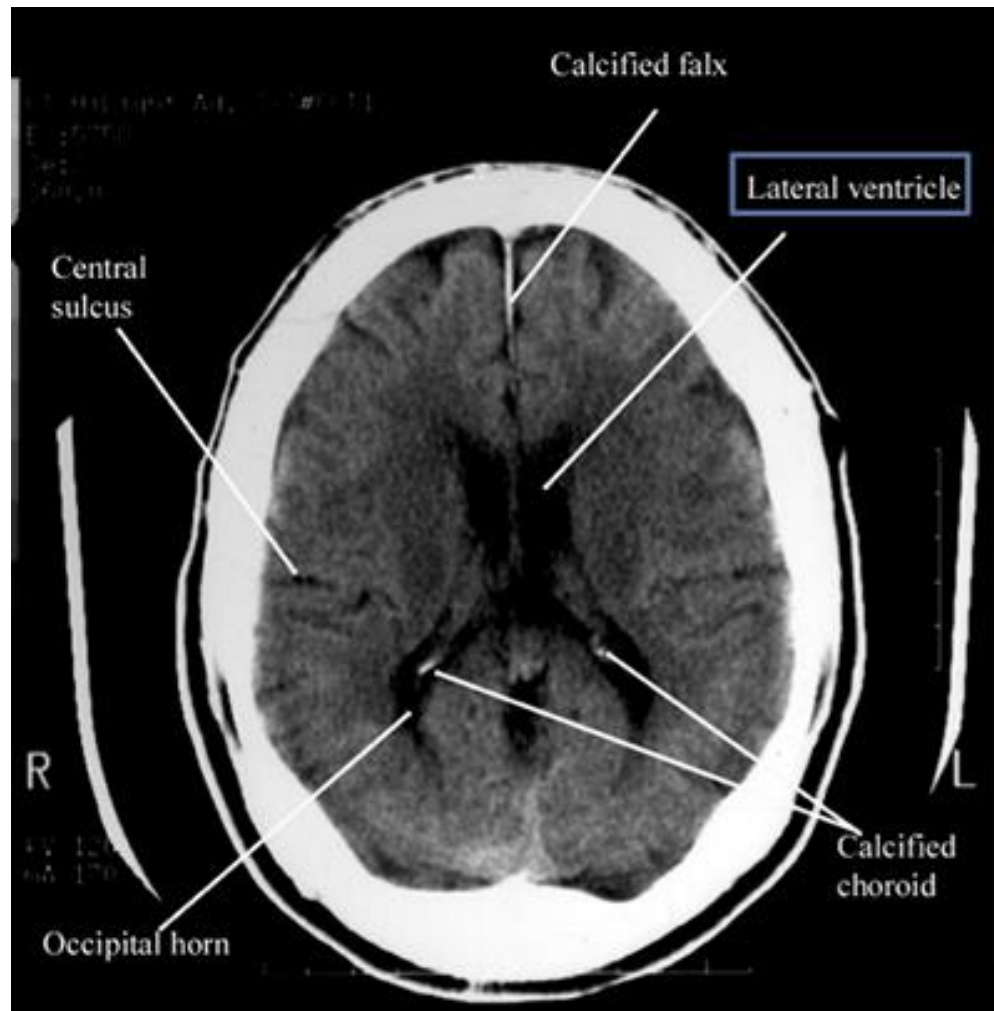
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B - blood C - cisterns B - brain V -
ventricles B - bones

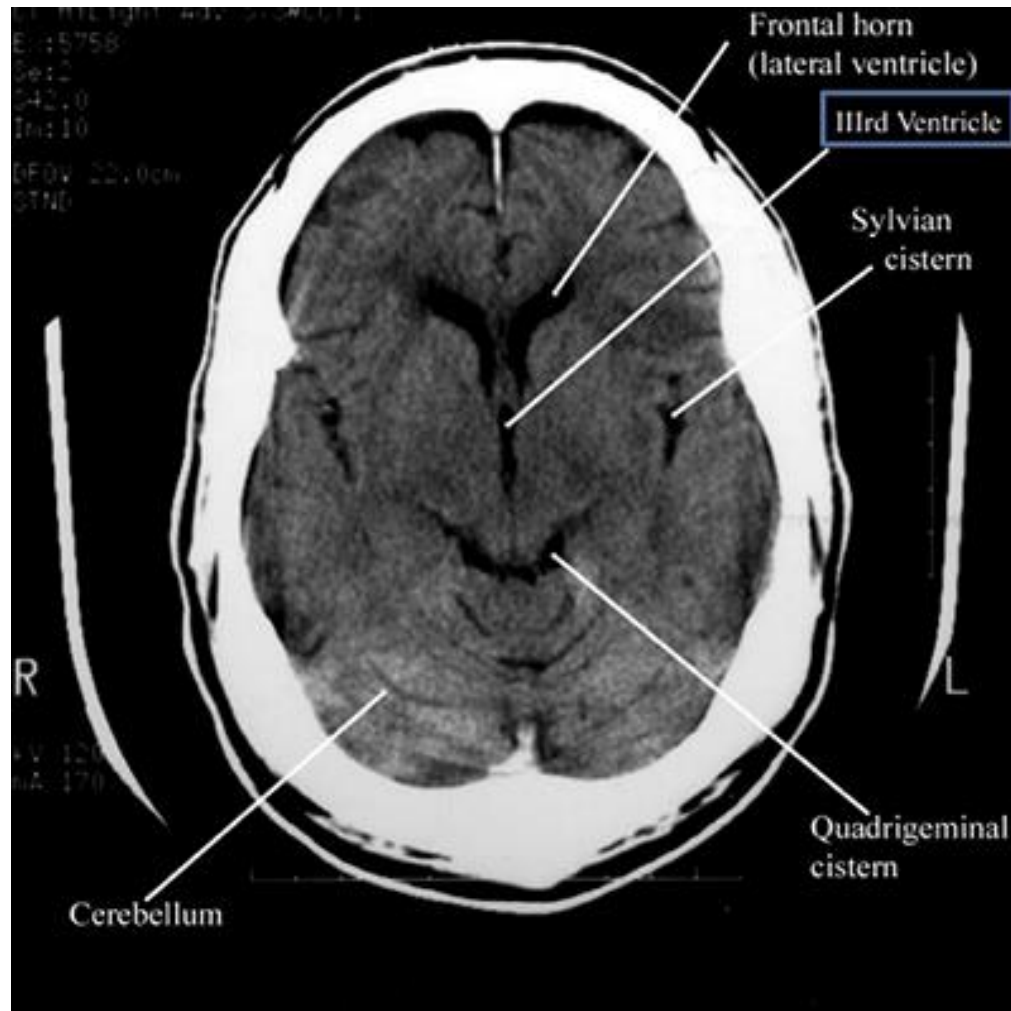
Ventricles

- Examine for dilation (hydrocephalus) or compression/shift, presence of blood.

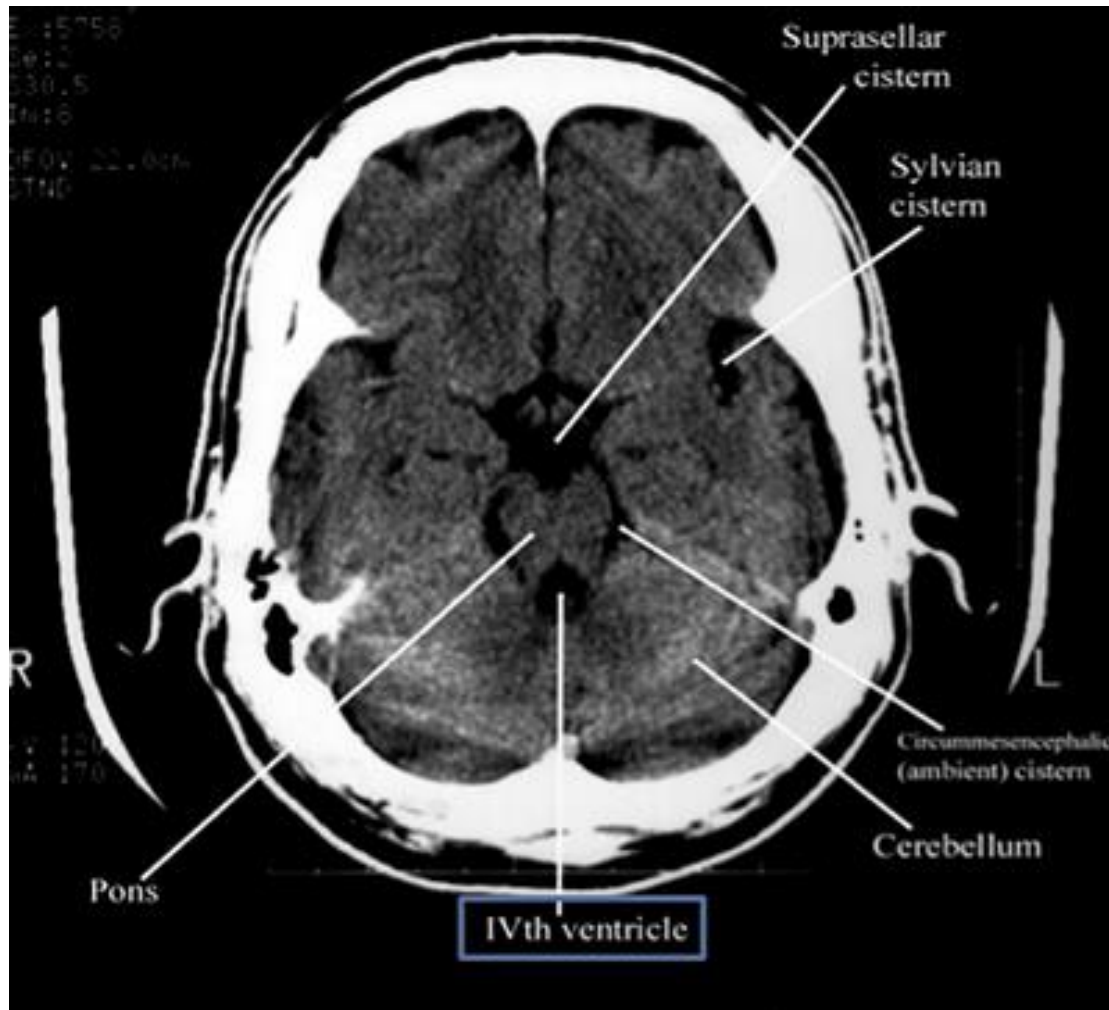
Lateral ventricle



3rd ventricle



4th ventricle



Ventricles

- Findings:
 1. Dilated lateral ventricles
 2. Effaced sulci
 3. No midline shift
 4. Symmetric brain parenchyma
- Diagnosis:
Hydrocephalus



Ventricles

- Findings:
 1. Dilated lateral ventricles
 2. Dilated sulci
 3. No midline shift
- Diagnosis: Brain atrophy



Blood Can Be Very Bad.

B - blood C - cisterns B - brain V -
ventricles B - bones

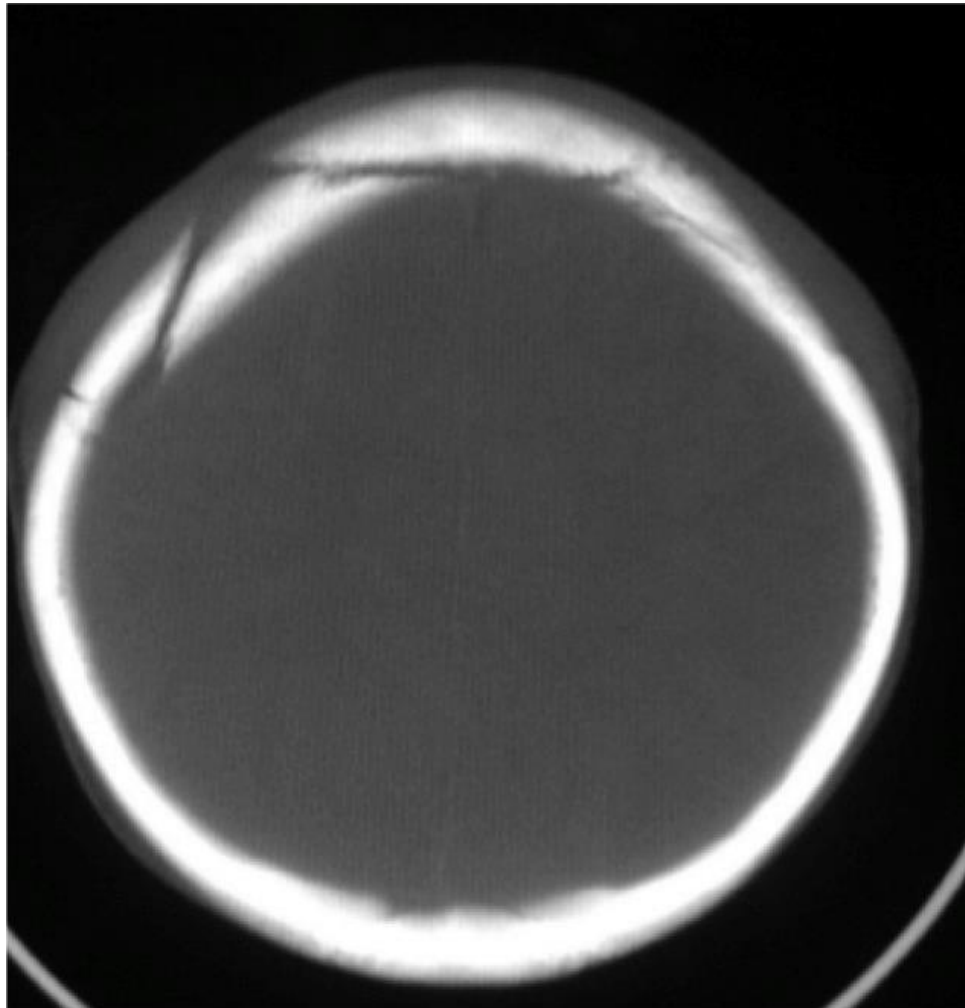
Bone

- Evaluate for
 - linear fracture
 - Depressed fracture
 - Suture widening
 - Bone erosions
 - Bur hole
 - Abnormal shape
 - Sella turcia .
- Types:
 - Simple.
 - Depressed: more than 0.5 cm or more than the skull vault thickness.

Simple fracture



Depressed fracture



Questions

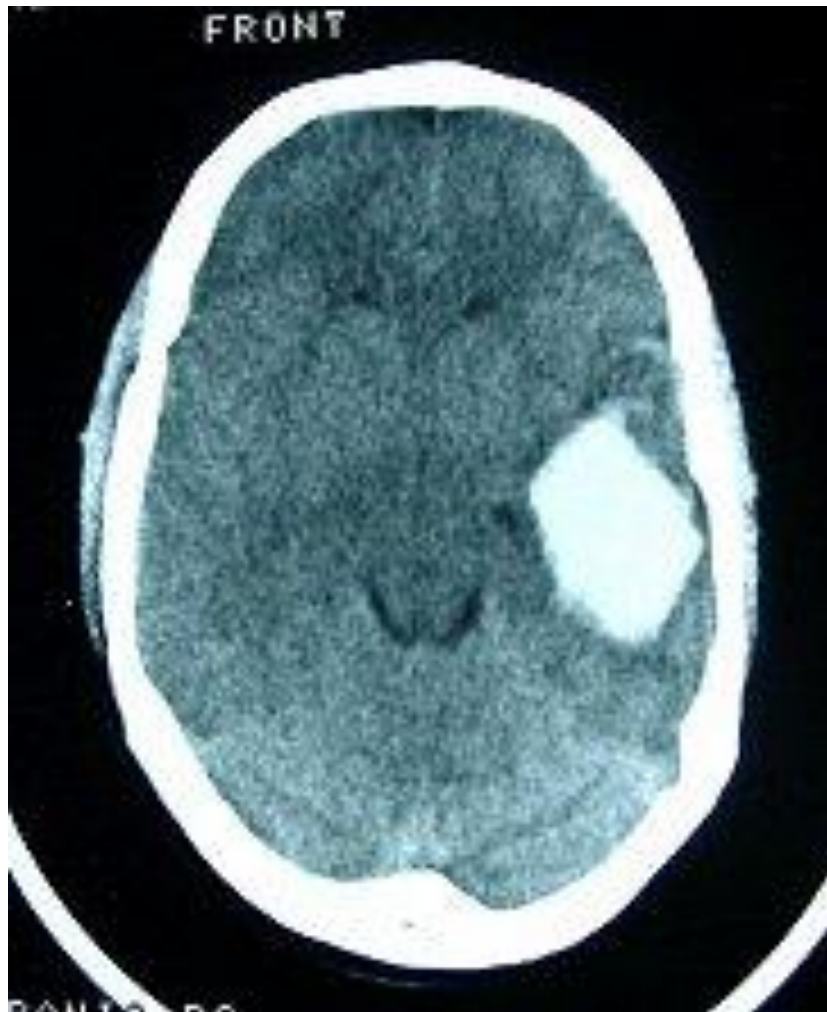
Diagnosis?



Diagnosis?

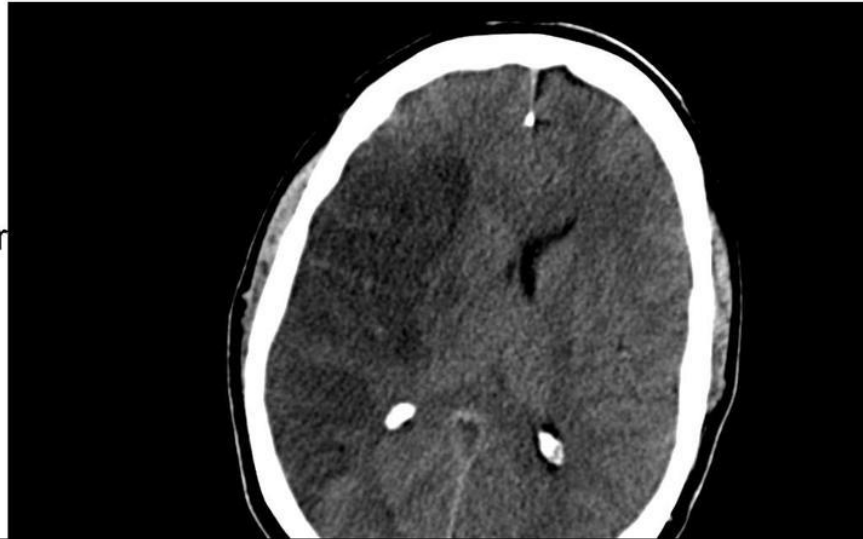


Diagnosis ?



Diagnosis?

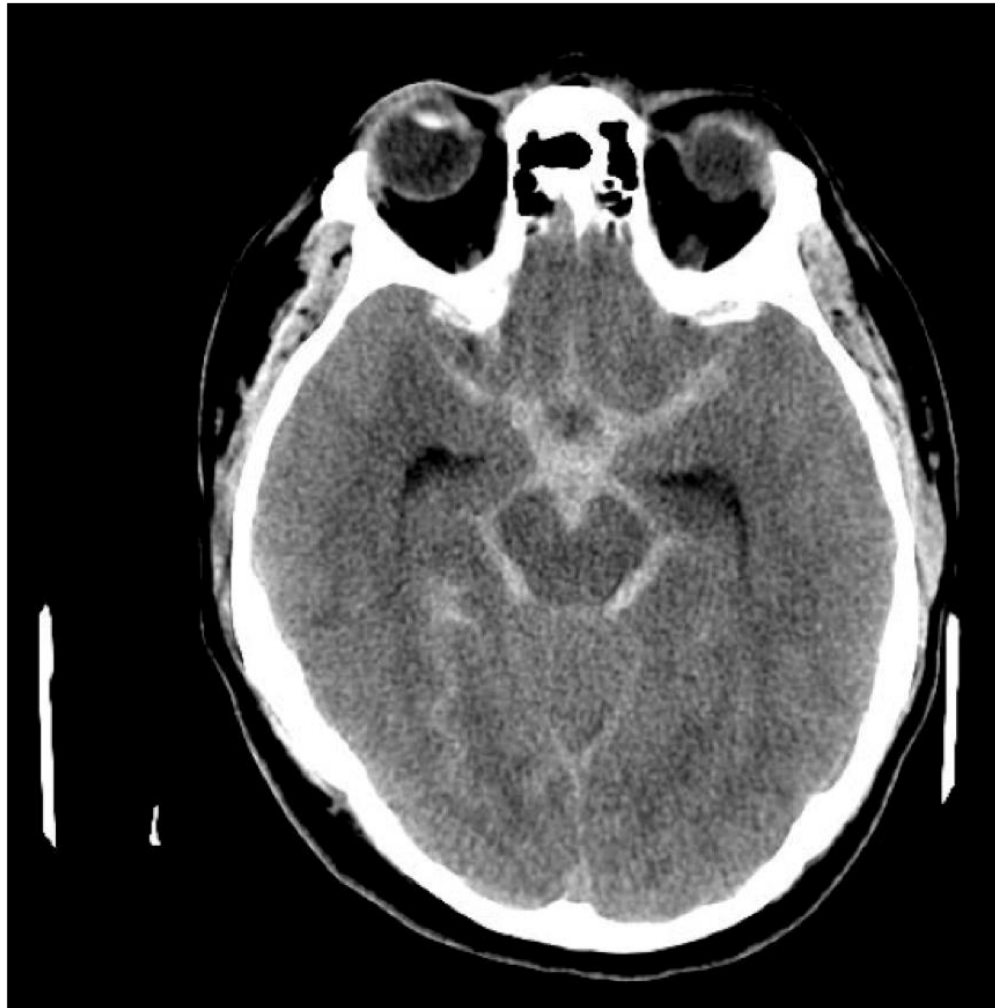
6 apr



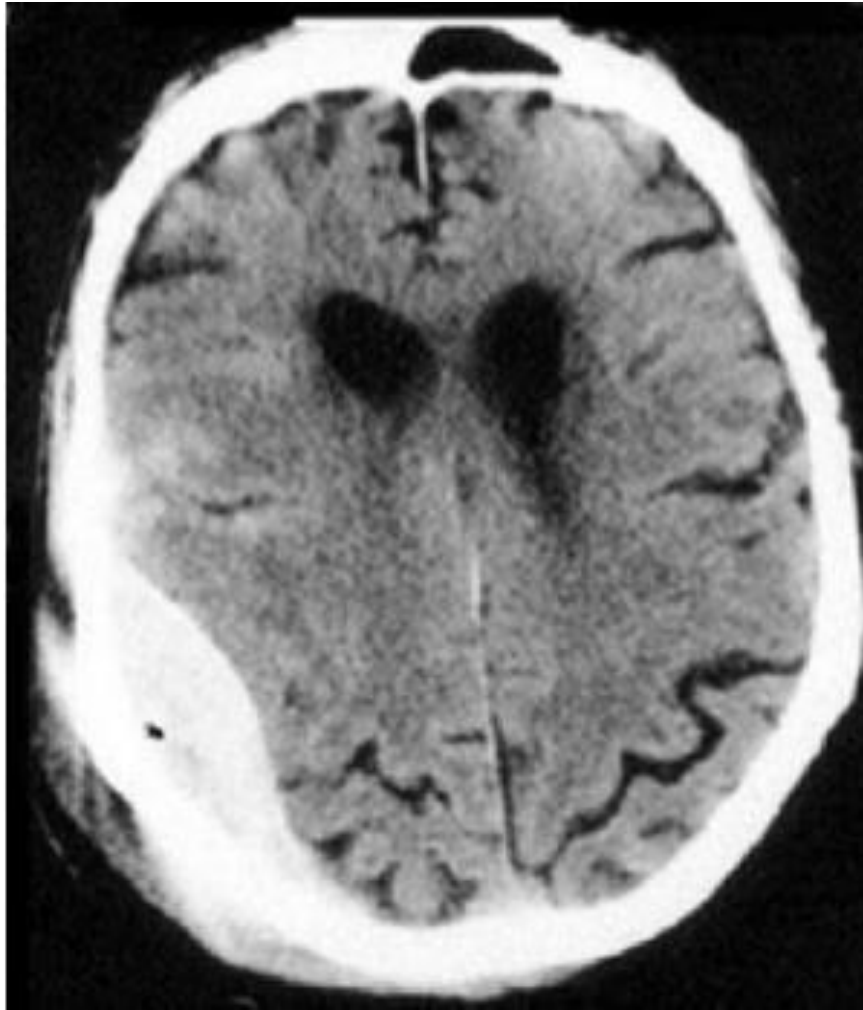
4 apr



Diagnosis ?



Diagnosis?



Thank you